# ENVIRONMENTAL SECURITY IN THE DANUBE RIVER BASIN: POLICY IMPLICATIONS FOR THE UNITED STATES

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The research for this project was completed in late 1998. Consequently, this paper does not attempt to address the environmental consequences of the recent armed conflict in Kosovo, nor the impacts resulting from the air campaign which accelerated an end to the hostilities.

A number of assertions have been made concerned with the long-term impact of the conflict on the environment. One preliminary assessment, carried out by the Regional Environmental Center for Central and Eastern Europe and contracted experts, found no significant evidence of any large-scale ecological catastrophe, but expressed concern over pollution associated with targeted industrial complexes and operations of refugee camps on water ecosystems.

It is premature to offer comment, owing to a lack of concrete data and study predating the conflict. The United Nations Environmental Programme and Çentre for Human Settlements jointly formed a Balkans Task Force that has been conducting independent and scientific assessments of the impact of the most recent armed conflict on the environment. Pending the findings in the task force's final report, further research may be required to reassess the major regional environmental security issues and policy responses identified in this paper.

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The North Atlantic Treaty Organization (NATO) School in Oberammergau, Germany allowed for the incorporation of a group exercise on regional environmental security of the Danube River Basin into their regularly scheduled course on Responsibilities of Military Forces in Environmental Protection.

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# EXECUTIVE SUMMARY

> *"A coordinated approach to solving environmental problems in Central and Eastern European countries may stimulate their economic and political cooperation, as well as reduce the risks of conflicts."* (1994 Report on Strategic Environmental Issues in Central and Eastern Europe, The Regional Environmental Center)

The Danube River is one of world's longest and busiest rivers. With over 30 of its tributaries navigable, it has long been crucial to the culture and economy of Central and Eastern Europe. It comprises an important aquatic ecosystem, draining 8 percent of Europe's land mass and supporting some 86 million people. Flowing through more countries than any other river on earth, the Danube eventually discharges into the Black Sea. The river also serves as a national border between several countries. This region's resources have been a key strategic objective for imperial aspirations over the centuries. The volatility of the area has served as a catalyst for one major world war earlier this century that enveloped the European continent. North Atlantic Treaty Organization (NATO) military forces are currently deployed in what may be a long peacekeeping role in the Balkans.

Danubian nations have been making substantial progress in restructuring their economic and political systems following the Cold War. Environmental challenges remain a legacy of half a century under totalitarian regimes. International, European, and American institutions have been actively supportive of ongoing regional economic transition. Economic development will generate the funding to pay for the upgrading of existing infrastructure and newer and more efficient environmental and energy systems that are capable of meeting higher Western performance standards. These improvements are required for these countries to successfully compete in the European, and other regional and global markets. Stable democracies and economies in Central and Eastern Europe are vital to the interests of the United States. In addition to economic restructuring and transition, there are a number of other environmental security issues believed likely to have an impact on future regional stability.

The Danube serves as a critical resource for water and hydroelectric power, and is the only access to the sea for Austria, the Czech Republic, Slovakia, and Hungary. The importance of the inland water system has increased with the recent completion of the Main-Danube Canal that now links both the North and Black Seas and which can now accommodate the larger Euro-barges, affording a more cost-effective and less polluting means of transport. However, expanded use has significant regional environmental consequences. The controversial Gabcikovo-Nagymaros hydroelectric dam project on the Danube energized public protests in the late 1980s that contributed to the downfall of the totalitarian regimes in both Hungary and the former Czechoslovakia.

The European Union has completed two recent assessments of environmental problems on the continent. No serious pollution problems, excepting a technological or natural disaster, are believed likely to cause large-scale damage or loss of life. The region is also heavily reliant upon polluting solid fuels and Soviet-designed nuclear reactors. Bulgarian and Slovakian nuclear reactors are major sources of public debate and interstate friction. Existing Soviet-designed reactors are of international concern and several nuclear safety initiatives are underway to support many of the Danubian nations in major upgrades and operational improvements. Degradation of air quality in the Danube basin is a problem

directly associated with regional energy needs. Many countries are faced with continuing to use readily available and cheaper fossil fuels than becoming overly dependent on cleaner Russian natural gas.

Ethnic conflict in the Balkans has resulted in hundreds of thousands of deaths and displaced persons, creating a significant refugee problem. The conflict also saw the deliberate and needless destruction of both industry and infrastructure, resulting in pollution throughout several sub-basins of the Danube. Regional demographics are also becoming increasing in more important as the rate of population growth declines and life expectancies increase, given that aging populations are generally more susceptible to infectious disease.

A regional approach is being used to address the restoration and protection of the Danube River. A permanent organizational structure under an International Commission for the Protection of the Danube River has recently been established with final ratification of the Danube Convention. An environmental program office has been functioning for over seven years, developing a strategic action plan and coordinating related national and regional activities. A similar ecogeographical approach is also being successfully applied for the Black Sea.

Ongoing and planned initiatives by international and regional institutions should be appropriately coordinated through the existing Environmental Programme for the Danube River Basin to better leverage existing capabilities and assets and to avoid duplication of effort. United States efforts should be focused, under State Department leadership, employing a coordinated interagency approach.

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## Tables and Figures

# 1. ACRONYMS

| | |
|---|---|
| AEPI | Army Environmental Policy Institute |
| AMEC | Arctic Military Environmental Cooperation |
| BSEP | Black Sea Environmental Program |
| CEE | Central Eastern Europe |
| CEI | Central European Initiative |
| DANIS | Danube Information System |
| DDRDI | Danube Delta Research and Design Institute |
| DEMDSS | Danube Emissions Management Decision Support System |
| DoD | Department of Defense |
| DoE | Department of Energy |
| DPCU | Danube Programme Coordination Unit |
| DPRP | Danube Pollution Reduction Programme |
| EAP | Environmental Action Plan |
| EAPC | Euro-Atlantic Partnership Council |
| EBRD | European Bank for Reconstruction and Development |
| EEA | European Environmental Agency |
| EPA | Environmental Protection Agency (U.S.) |
| EPDRB | Environmental Programme for the Danube River Basin |
| EU | European Union |
| FSU | Former Soviet Union |
| GEF | Global Environmental Facility |
| GIS | Geographical Information System |
| IAEA | International Atomic Energy Agency |
| ICJ | International Court of Justice |
| IDA | International Development Association |
| ICPDR | International Commission for the Protection of the Danube River |
| IEMTF | Interagency Ecosystem Management Task Force |
| IIASA | International Institute for Applied Systems Analysis |
| IMF | International Monetary Fund |
| INSS | Institute for National Security Studies |
| MOU | Memorandum of Understanding |
| NAPs | National Action Plans |
| NATO | North Atlantic Treaty Organization |
| NGOs | Non-Government Organizations |
| OECD | Organization for Economic Co-operation and Development |
| PfP | Partnership for Peace |
| REC | Regional Environmental Center |
| SAIC | Science Applications International Corporation |
| SECI | Southeast European Cooperative Initiative |
| SIP | Strategic Action Plan Implementation Program |
| UNEP | United Nations Environmental Program |
| USEUCOM | United States European Command |
| WWFN | World Wide Fund for Nature |

## 2. INTRODUCTION

This paper examines the environmental security issues having the most likely potential to impact stability within the Danube River Basin, and recommends areas for future policy consideration and emphasis. Knowledge of such issues allows for a more proactive and better coordinated response in helping to ensure that U.S. national interests in the region are protected.

### Major Objectives of the Paper

The specific research objectives of this paper were to:

1. Describe the general environmental condition and stressors in the Danube River Basin and identify major environmental security issues most likely to pose the greatest threats both to regional stability and U.S. national interests;

2. Review existing cooperative initiatives to restore and manage this valuable ecosystem by international, regional, and national institutions, non-government organizations, and the U.S.;

3. Review how U.S. capabilities and assets might be used to address priority environmental security issues;

4. Review specific cases where environmental conditions are believed to have contributed to conflict.

5. Conduct a preliminary assessment of available modeling software to determine its usefulness in predicting situations where potential conflict might erupt and where proactive involvement by the U.S. would be advantageous in disarming the situation.

6. Develop several case studies as representative of environmental security issues that have led, or could easily lead, to increased instability within the region for further examination in appropriate curriculums involving environmental policy and security studies

### Methodology Employed

This paper was prepared using a variety of different information collection methods, to include an exhaustive literature review conducted in both the United States and Europe of several major universities, research centers, and regional organizations having interests in Central and Eastern Europe (CEE). Interviews were also conducted of key officials of the Environmental Programme for the Danube River Basin and regional Non-Government Organizations (NGOs). A survey was developed in accordance with appropriate practices (Babbie, 1990), that was used primarily in the interviews, as well as being sent to targeted individuals not available for interviews.

A brief group exercise was conducted at the NATO School in Oberammergau , Germany that was incorporated into an ongoing two-week environmental course regularly offered to NATO and Central and Eastern European officers, noncommissioned officers and civilians working related environmental programs within their respective military organizations. Four separate work groups were established based on affiliation with the Danube River Basin. Each group was requested to provide a consen-

sus ran-ordered listing of the major environmental issues or stressors they believe are confronting the basin. A more detailed discussion of the group exercise is provided at Appendix C.

**Chapter Focus**

The following provides a synopsis of what will be covered in each of the chapters and the specific research questions addressed.

**Chapter 3** introduces the term "environmental security," reviewing the development of the concept, and the ongoing debate as to its definition and usage and implications to national security. Several simple paradigms are offered to visualize the complex interaction among factors impacting national and regional stability. The application of the concept by several key government agencies is presented. An "ecogeographical" approach is suggested as a means for fostering comprehensive regional security.

**Chapter 4** provides an overview of the physical, historical, and cultural factors impacting regional development. This development is shown to have been influenced by both Western and Eastern civilizations over the centuries. Cultural and historical fault lines will be introduced as a means for better understanding the current Balkan ethnic unrest. An overview is provided of the major environmental problems confronting the nations, of the Danube [addresses research question 1].

**Chapter 5** provides a detailed review of environmental security issues having the potential to impact regional stability. Foremost among these issues is the ongoing economic transition in CEE after decades of environmental neglect under centrally planned economies. The CEE region remains dependent upon pollution-generating solid fuels and Soviet-designed nuclear power plants. Options available in the pursuit of energy self-sufficiency will be examined. This chapter also reviews the environmental and security considerations associated with the expanded use of the 4,300 kilometers of inland waters in the Danube River Basin. The environmental consequences associated with ethnic conflict will be briefly discussed. Regional demographics are examined, focusing on the security implications that increasing life expectancies and immigration policies will have on many nations and the region. Finally, three case studies are presented as representative of regional environmental security issues [addresses research questions 1,4, and 6].

**Chapter 6** will examine efforts taken by both international and regional institutions in addressing the environmental security issues identified in Chapter 5. The structure, capabilities, and expertise of these institutions will be briefly highlighted. This review is important in identifying areas where additional emphasis or coordination is needed [addresses research question 2].

**Chapter 7** summarizes some of the major conclusions made in the prior chapters and recommends areas for future policy considerations and emphasis. A common observation is the need for more focused and coordinated efforts by many regional institutions and the U.S. [addresses research question 3].

**Appendix A** provides an expanded discussion on the development of socio-economic and environmental indicators that have been widely used as a means of influencing public policy. However, environmental indicators are a relatively new and often controversial area, with many international institutions conducting pioneering work to develop consistent indicators and aggregated indices that can be more easily communicated [addresses research question 5].

**Appendix B** provides a preliminary assessment of environmental decision support systems. An integrated, or hybrid, Geographic Information System (GIS) and Decision Support System (DSS) is proposed as incorporating the best of both a simulation and graphics packet. Such approaches are becoming increasing more affordable and practical with the exponential growth in automation technology [addresses research question 5].

**Appendix C** presents the results of a group exercise on environmental security in the Danube River Basin conducted on 20 July 1998. The class exercise involved some 40 international students during a regularly scheduled two-week NATO environmental course. The students were broken into four preassigned work groups. A summary is presented of the major environmental issues and stressors identified by each of the work groups.

# 3. ENVIRONMENT AND SECURITY

The environment has only recently taken a more prominent position in United States national security deliberations and planning. A new term "environmental security" has emerged, its definition and usage still much debated. This chapter provides an overview of the development of this concept and presents several simplistic paradigms to illustrate what is actually a complex linkage of social, economic, political, and environmental effects, and how their interaction might lead to instability. Also discussed are how several key U.S. government departments and agencies have defined and incorporated the concept into their operations, as well as their respective capabilities and expertise. The final section of the chapter makes a strong argument for addressing environmental security on an ecogeographical basis, with the Danube River Basin recommended as a natural unit for fostering comprehensive regional security in Central and Eastern Europe.

## 3.1 Redefining Security

The end of the Cold War has introduced a new set of emerging transnational phenomena that will increasingly effect international stability. Many of the assumptions and institutions that have governed international relations in the past are a poor fit in today's realities, suggesting a redefinition of what constitutes national security (Mathews, 1989). National security has traditionally been defined in excessively narrow and militaristic terms (Ullman, 1983), prompting the introduction of the concept of "world security." It recognizes than many new emerging perils may transcend the capabilities of nations to act in a unilateral and self-interested fashion against external threats to survival (Klare and Thomas, 1994).

Globally, non-military threats such as environmental degradation and rapid population growth will have important long-term security implications that will become increasingly difficult to ignore. It has also been suggested that interstate conflict over territory will likely be surpassed by a competition over resources (Ullman, 1983). While such issues have been met in the past with skepticism or boredom in foreign policy circles, and treated as low politics, it is hypothesized that the environment will be a major national security issue well into the next century (Kaplan, 1994). Gleick (1991) recommends that environmental security "challenge the monopoly that political and military security analysts have exercised on interstate politics," and that an effort be made to better understand the connection between environment and security.

Deudney (1990) takes a different view, believing the exploration of such links are a means to exact new missions for security organizations following the end of the Soviet threat, and does not believe that environmental degradation is likely to lead to interstate conflict. Rather, the world is believed more resilient, that it can weather significant environmental disruption without resorting to interstate conflict. Further, the potential for resource wars may be diminishing because nation states also find it increasingly difficult and costly to exploit foreign resources through territorial conquest. Historic tensions and conflicts over nonrenewable mineral and energy resources may also be diminishing with stronger world trade markets, better able to provide alternative sources or substitutes (Gleick, 1991).

Environmental security has been offered as a term to redefine national security to encompass resource and environmental threats. A broad interpretation of environmental security views severe environmental degradation and stressors as presenting a security threat as serious as war. Those supporting a narrower definition focus on the protection of national (domestic) resources from both external and internal environmental threats and disasters. The term has been used more recently by researchers to address the link between environmental scarcity, exacerbated by demographic change, and violent conflict. It has also been viewed from the reverse perspective of how violent conflict might negatively impact the environment. Yet another variant considers environmental security as protection from ecoterrorism.

The role of the environment in national security policy remains the subject of lively debate and, thus, no single definition has yet to receive widespread general acceptance. Several institutions have been created to address this relatively new concept. One example is the Environmental Change and Security Project (ECSP), established at the Woodrow Wilson International Center for Scholars in 1994. Its stated mission is to promote increased dialogue and scholarly debate on the topic of environment, population, and security through discussion group meetings, conferences, and publications. The ECSP publishes an annual report on its activities and maintains a comprehensive bibliographic guide to the literature.

## 3.2 Evolving Paradigms

Current research efforts have attempted to assist with the ongoing debate on how best to address the environment in national security policy. Much of this research has focused on the "linkages" between social, economic, political, and environmental effects and how their interaction might lead to increased national or regional instability and conflict. The causal relationships have important consequences to decision makers considering how and when to intervene to resolve a conflict in its the early stages before they escalate to a point where the use of military force becomes more likely.

The inability of United Nation organizations and other institutions to cope with increases in international environmental conflicts (IEC), and an apparent academic "gap" in related research, prompted Trolldalen (1992) to develop a conceptual, theoretical, and empirical framework for IEC evaluation. Trolldalen recognized that nations had developed different ways of managing competition for natural resource utilization and responding to the effects of "environmental degradation." He suggests that the global interdependence of many environmental issues indicates they can no longer be managed from a single national center.

Trolldalen (1992) introduces a simplified model portraying what is actually a rather complex escalation pattern of an IEC. The vertical axis of the escalation model depicts four increasing levels (phases) of polarization: incipient, latent, acknowledged, and overt conflict. The horizontal axis depicts the passage of time. The transition between phases is suggested to be more continuous than discrete. The number of parties involved in the conflict tends to increase as the conflict escalates and becomes more polarized, often escalating from a local conflict to one with more regional or global ramifications. Preventive measures are appropriate in the incipient phase. Specialized organizations may achieve success at both the incipient and latent phases. If no attempt is made to prevent or avoid the IEC, it can easily escalate to an interim settlement (acknowledged) phase, or lead to violent conflict.

Trolldalen (1992) introduces a complementary paradigm he terms a Systemic Environmental Conflict (SEC) model in which environmental, economic, and socio-political aspects can be integrated. This model, reportedly, demonstrates how the demand created by human consumption of natural resources between two adversarial parties is an essential driving force behind IECs. The model is offered as a predictive tool, but no specifics are provided. Rather, a further simplified "ABC model" is used to reflect how the natural resources base results in further externalities, or negative environmental side effects. This model is used to review four possible forms of conflicts through different case studies.

Application of this model is made to an international river system where competition for both quality and quantity of water has the potential to lead to conflict that is shared between two or more riparian nations. Reportedly, there are some 200 such large river systems (Trolldalen, 1992). A comparative summary of some of the major European rivers is given in Table 3.1 (Page 22). The Danube itself flows through more countries than any other river on earth (World Wide Fund for Nature, 1998), each placing conflicting demands upon it as a major natural resource providing water, navigation, and hydroelectric power. A simplistic representation of the Danube system using the ABC model is depicted in Figure 3.1 (Page 23).

The Project on Environment, Population and Security (EPS) at the University of Toronto's Peace and Conflict Studies Program has done pioneering work since the early 1990s, investigating the complex relationship between environmental scarcities of renewable resources and violent conflict in developing countries (Homer-Dixon, 1996a). This research made a distinction between renewable and nonrenewable resources, and limited itself to violent conflict, since it is easier to identify and measure. Renewable resource scarcity occurs from degradation or depletion, increased consumption, and uneven distribution. The Project used empirical data to evaluate case studies on Mexico, Pakistan, Rwanda, and South Africa. The term "security" has typically been avoided in articles by Homer-Dixon, given its broad interpretation and the potential to be misunderstood. A simplified schematic of the factors whose interaction may lead to a form of instability or conflict is shown in Figure 3.2 (Page 24).

The Project's research suggests that environmental scarcity is generally never the sole cause of conflict, but interacts with other socio-economic and political factors to precipitate civil strife and social disruptions (Homer-Dixon, 1996a). Environmental scarcity can easily lead powerful groups to capture valuable resources (resource capture) while forcing marginal groups to migrate to areas less able to sustain them (ecological migration). There is also little empirical support for an earlier hypothesis that environmental scarcity of renewable resources causes simple-scarcity conflicts or (resource wars) between states (Homer-Dixon, 1994). Homer-Dixon (1996b) proposes that researchers and policy makers consider all three major sources of environmental scarcity (Figure 3.2, Page 24), rather than continuing to focus solely on "environmental degradation."

Of 12 conflicts in this century studied by Westing (1986, as presented in Homer-Dixon, 1994), ten involved access to oil or minerals, while only five can be attributable to renewable resources. Of these five, the 1969 Soccer War between El Salvador and Honduras was primarily a result of cropland dispute and land distribution, to the detriment of poor farmers, and the 1972-1973 Anglo-Icelandic Cod War involved very little violence. Homer-Dixon (1994) attributes the focus on conflict over nonrenewable resources, primarily oil and minerals, to their relative importance to an industrialized and militarized nation. Poorer nations dependent on renewable resources are typically not in the best position to conduct a resource war on neighboring states.

## Table 3.1 - Comparison of Major European Watersheds

| Characteristic | Danube | Volga | Dnieper | Rhine-Maas |
|---|---|---|---|---|
| **Watershed Area (000 km2)** | 796 | 1484 | 502 | 199 |
| **Countries in Watershed (a)** | 13 | 2 | 3 | 8 |
| **Pop. Density per sq.km.** | 103.5 | 41.4 | 67 | 304.1 |
| **Land Use:** | | | | |
| **Cropland (percent)** | 66.5 | 59.2 | 85.4 | 64.2 |
| **Forest (percent)** | 20.4 | 23 | 3 | 7.2 |
| **Developed (percent)** | 11.3 | 10.3 | 9.8 | 26.2 |
| **Original Forest (percent)** | 63.1 | 53 | 77.6 | 71 |
| **Arid Area (percent)** | 2.6 | 18.6 | 3.6 | 0 |
| **Wetland Area (percent)** | 1.4 | 2.6 | 6.2 | 1 |
| **Protected Area (percent)** | 6.6 | 1.1 | 1.2 | 18 |
| **Number of Ramsar Sites (b)** | 47 | 3 | 0 | 20 |
| **Nutrient Concentration:** | | | | |
| **Nitrate (mg/l)** | | 0.62 | 0.2 | 3.88 |
| **Phosphate (mg/l)** | 0.1 | 0.02 | 0.01 | 0 4 |

Notes

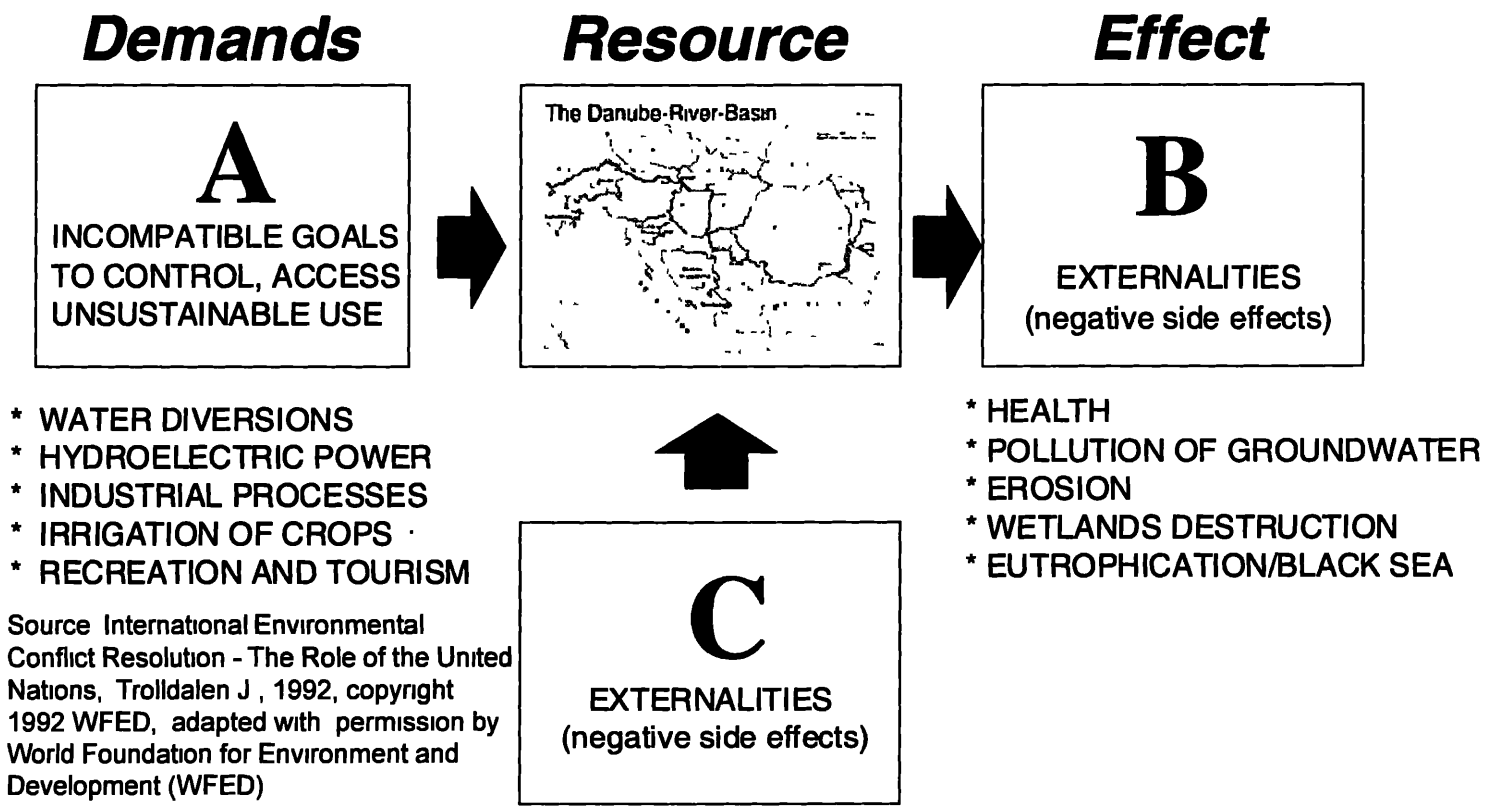
a Excludes countries have <1% area in the watershed

b Wetlands of international importance

Source

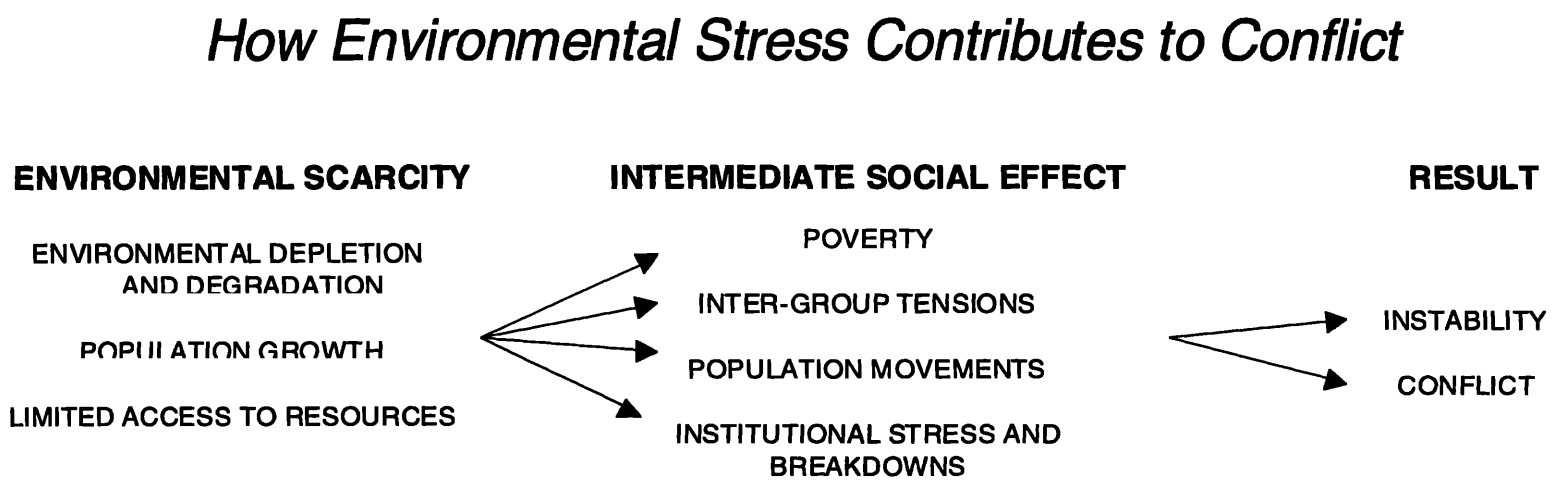
World Resources 1998-1999 - A Guide to the Global Environment, 1998, Oxford University Press, copyright 1998 WRI, data tables adapted by permission of World Resources Institute (WRI)

**Figure 3.1 - ABC Model: River System**



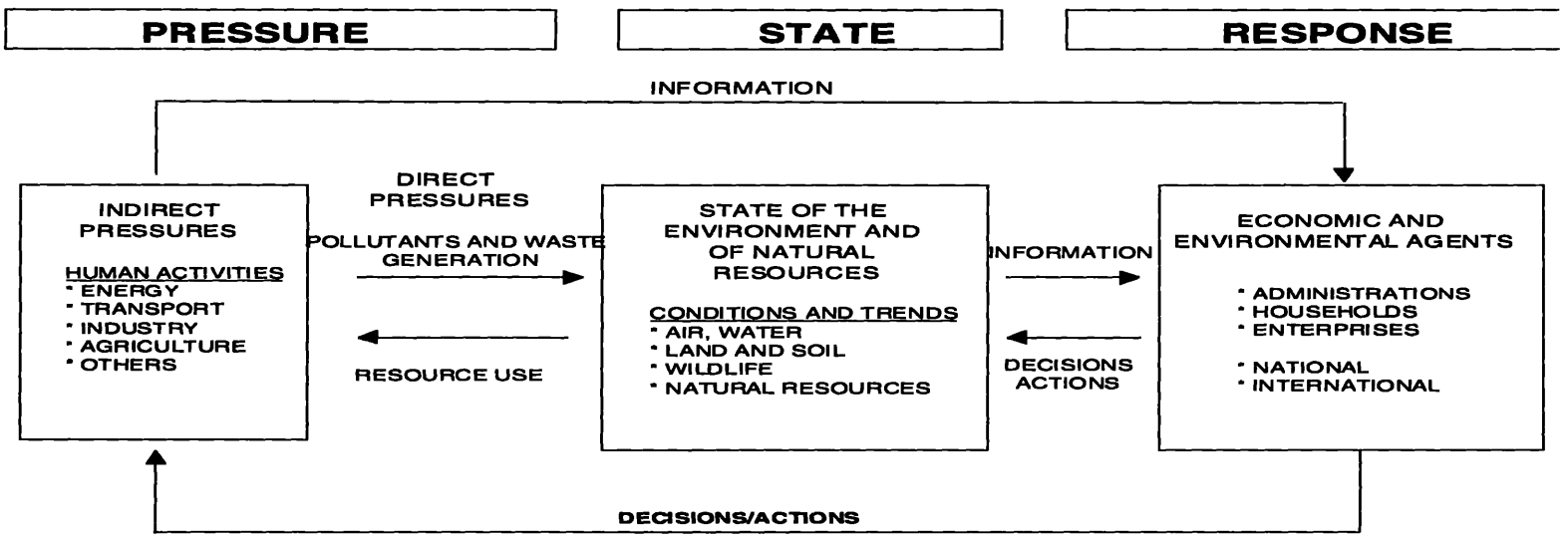

Source International Environmental Conflict Resolution - The Role of the United Nations, Trolldalen J , 1992, copyright 1992 WFED, adapted with permission by World Foundation for Environment and Development (WFED)

## Figure 3.2 - Environmental Scarcity Model




Source The Project on Environmental, Population and Security Key Findings of Research, Homer-Dixon, 1996, Environmental Change and Security Project Report, Issue 2, Spring 1996 45-48, the Woodrow Wilson Center, Smithsonian, reproduced with permission of Professor Thomas Homer-Dixon

## Figure 3.3- Pressure-State Response Model




Source Towards Sustainable Development - Environmental Indicators, 1998, OECD Publications, copyright OECD 1998 reproduced by permission of the Organization for Economic Co-operation and Development (OECD)

Several researchers have concluded that, should an interstate resource war occur, it will most likely be over "river water" given its importance to the national survival of so many developing nations and because it can be so easily impacted by upstream riparian nations (Homer-Dixon, 1994 and Gleick, 1993). The majority of water-limited nations are located in Africa and Asia, however, several CEE nations (e.g., Hungary, Bulgaria, and Romania) face water availability issues (Gleick, 1993), an issue addressed again later in the paper.

A pressure-state-response (PSR) model that employs a causal framework has been under development by the Organization for Economic Co-operation and Development (OECD), in association with a core set of environmental indicators. This effort was based on earlier work by the Canadian government (Hammond et. al, 1995). The PSR model (Figure 3.3, Page 25) is helpful to the decision maker in better understanding the links between human activities that exert pressure on the state of the environment, and societal response. However, it should be understood that the actual relationships between the environment and other socio-economic and political factors are very complex (OECD, 1998c). A more extensive discussion of both the PSR model and environmental indicators is provided in Appendix A.

## 3.3 Refocusing of Mission

The importance of the major environmental threats has found an increasingly prevalent status in U.S. national security planning. The realization that many threats are transboundary, heeding no national border, and can pose long-term problems is highlighted in the U.S. National Security Strategy (White House, 1997). In advancing U.S. national interests the Strategy restates the constitutional mandate that American lives will be protected at home and abroad, the sovereignty of the country will be maintained, and the well being of the nation and its people will be provided for.

The Strategy also stresses as the imperative of engagement, the need for the United States to exert global leadership, using available resources, to influence the actions of other nations. America's prosperity is tied closely to that of Europe. Thus the Strategy seeks to focus environmental technical assistance and expertise on those Central and Eastern (CEE) countries that have "suffered the most acute environmental crisis". In response, the current administration has been active in establishing and implementing environmental security programs and initiatives within its departments and agencies involved in international activities.

### Environmental Diplomacy

In a 1996 keynote address at Stanford University, then-Secretary of State Warren Christopher announced a new policy realignment for his Department, stressing the role of diplomacy in addressing environmental quality and resource protection (Christopher, 1996). He emphasized the need for the State Department, "as the flagship institution of America's foreign policy....to spearhead a government-wide effort to meet...environmental challenges." He recommended that the Department and other agencies pursue environmental priorities on four levels: globally, regionally, bilaterally, and in partnership with Non-Governmental Organizations (NGOs) and private businesses. Building stable markets in both the former Soviet Union and Central Europe was viewed as critical to reinforcing the security of the United States.

Current Secretary Madeleine Albright remains committed that "America should be the world's environmental leader," given that "environmental degradation...is a real threat to our (U.S.) national security" (Albright, 1994). In April 1997, the Department released its first annual report on the environment with future reports to be released every year on Earth Day (State Department, 1997). The annual report entitled "Environmental Diplomacy" outlines the Department's priorities in tackling increasingly complex environmental issues in water resources, air quality, energy resources, land use, and urban and industrial growth. Improvement of Soviet-designed nuclear reactors also remains a high priority issue for CEE.

**Preventive Defense**

The U.S. Department of Defense (DoD) has defined its environmental security mission as "assuring that DoD missions are performed in an environmentally responsible, safe and healthful manner, that environmental threats that could lead to internal instability are deterred and, when appropriate, that DoD assets are applied to mitigate environmental effects of natural or man-made disasters (DoD, undated and 1993)."

The term environmental security has recently been defined in DoD environmental policies as: "a program that enhances readiness by institutionalizing the Department of Defense's environmental, safety, and occupational health awareness, making it an integral part of the Department's daily activities. Environmental Security is comprised of cleanup, compliance, conservation, pollution prevention, safety, occupational health, explosives safety, fire and emergency services, pest management, environmental security technology, and international activities" (DoD, 1996a and 1996b).

Given a refocusing of mission, the Department reorganized in 1993, creating a new position of Deputy Under Secretary of Defense for Environmental Security, to fulfill four major goals:

- to comply with the law;
- to support military readiness of the U.S. armed forces by ensuing continued access to the air, land, and water needed for training and testing;
- to improve the quality of life for military personnel and their families by protecting them from environmental, safety, and health hazards and maintaining quality military facilities, and;
- to contribute to weapons systems that have improved performance, lower cost, and better environmental characteristics (DoD, 1998a).

U.S. national security is dependent upon preventing the conditions that lead to interstate conflict and help create the conditions for peace. Former Secretary of Defense William Perry, in a 1996 speech to Harvard's John F. Kennedy School of Government, coined the strategic concept of "preventive defense" (Perry, 1996). At the heart of this concept is the pursuit of the underlying causes of conflict and instability, obtaining adequate warning of potential crises, and acting well before a crisis to avoid costly military interventions. Preventive defense is viewed as providing the United States its first line of defense, deterrence its second, with military force being used only as a last resort.

Environmental security is viewed as a tool for preventive defense. It provides another avenue by which to engage and influence the militaries of other nations by helping these militaries to enhance their environmental awareness and build the organizational capacity necessary to minimize their impact on the environment. In doing so, it has the potential to contribute to building democracy, trust, and

understanding. The challenges of how and where to focus the DoD's efforts in environmental cooperation, and how and where environmental degradation and scarcity are likely to lead to instability, constitute what has been termed the "environmental security pillar" of preventive defense (Goodman, 1996).

The Department and its Services have unique organizational, logistical, technical, and intelligence capabilities and assets which make it a logical choice to execute U.S. environmental security missions (Butts, 1993a and 1994). DoD's main environmental security focus areas have been in the life cycle of weapons systems acquisition; partnerships with States, tribal nations, and private citizens; and international activities involving environmental security cooperative initiatives with the militaries of other nations. DoD's environmental cooperative initiatives with the North Atlantic Treaty Organization (NATO) are reviewed later in the report.

**Beyond Nuclear Safety**

The Department of Energy (DoE) not only possesses unique capabilities solely in the energy sector, but also has at its disposal a diverse laboratory system that has made significant scientific and technological achievements across a broad spectrum of disciplines to include national security policy. The DoE views environmental security well within its scope of mission and interests in analysis, research, and testing; hazardous and radioactive waste remediation; nuclear safety in the decommissioning of facilities and safe handling of nuclear materials and wastes; and infrastructure development in power generation, energy efficient distribution systems, and waste treatment (Haspel, 1998).

Reportedly, the DoE views environmental security through three filters, evaluating: the presence of a significance environmental stressor; the relative contribution of the stressor to regional instability; and the relative strategic importance of the region to the United States (Berry, 1997). The DoE is currently active in a number of regional environmental cooperative activities with other U.S. and foreign agencies in the Baltics, Russian Arctic, and CEE, where these criteria have been met. The Department has been very active in the establishment of a safety program to reduce the risks associated with Soviet-designed nuclear reactors (Center for Environmental Security (CES), 1998).

**Emphasis on Pollution Prevention**

The U.S. Environmental Protection Agency (EPA) views environmental security as "the minimization of environmental trends or conditions involving other countries that could, over time, have significant negative impacts on important U.S. national interests" (Nitze, 1997). EPA is developing and implementing a program envisioned to proactively support U.S. efforts to manage environmental threats comprising five elements:

- anticipating future environmental and national security concerns;
- addressing regional environmental threats and enhancing regional security; abating global environmental effects;
- managing conditions resulting from the legacy of the Cold War; and ensuring compliance with international treaties and elimination of environmental crimes (Hecht, 1998).

In Central Eastern Europe, the EPA was instrumental in opening a Regional Environmental Center (REC) in Budapest in 1990, following the fall of the Berlin Wall. The EPA, under a grant from the U.S. Agency for International Development, has also been active in providing technical assistance to Central Eastern European countries on a variety of different environmental problems, especially those related to air and water pollution. It has been working with the European Union in addressing long-range transboundary pollution on the continent, and in establishing pollution prevention centers in the Czech Republic and Poland (EPA, 1998).

**Enviro-Intelligence**

The U.S. Central Intelligence Agency (CIA) advises the President and National Security Council on intelligence matters of national security. The CIA has at its disposal a broad spectrum of classified information that has been acquired by both human and technical collectors as well as open-source information. The latter sources have grown exponentially with that of the Internet. The CIA had analyzed environmental issues at the request of policy makers and consumers from various levels within the U.S. government to include, on a case-by-case basis, the impact of the environment on the political and socio-economic stability of other nations and regions. This information has already been used to monitor compliance with international treaties.

The collapse of the Soviet Union as a global power has dramatically altered U.S. national security policy and brought into question the value of espionage agencies in a new more open era. Several legislators leveled sharp criticism at the intelligence community, primarily the CIA for failing to predict the demise of the Soviet Union, raising the possibility that some intelligence duties should be transferred to other departments such as the State Department (Johnson, 1992).

Much of this criticism might have been triggered by the fear of uncertainty relating to future and yet unknown threats confronting the U.S. beyond global proliferation of nuclear, biological, and chemical weapons, and the worldwide flow of conventional armament. In response, President Bush signed National Security Review No. 29 in 1991. It directed the intelligence agencies to compile an exhaustive list of priorities that would go beyond their traditional discussions and focus on such issues as ethnic and territorial disputes and the intentional spread of pathogens that could destabilize foreign governments (Johnson, 1992).

A major weakness with many international environmental conventions and protocols is a lack of effective monitoring and enforcement. Consequently, it has been recommended that the U.S. and other nations share their aerial and satellite imagery data more generously with the United Nations and with the private sector as a whole (Johnson, 1992). The U.S. and Russia recently met to trade unclassified data from their respective Cold War reconnaissance imaging satellites, the CIA providing photos on the Siberian forests in exchange for similar imaging on America's Alaskan forests (Auster, 1998).

The Department of Defense intelligence capabilities are also showing promise for use by environmental scientists. The Navy's integrated undersea-surveillance system (IUSS), designed to detect enemy submarines, was unveiled earlier and made available to civilian scientists (Economist, 1994). The system has already been used by one researcher to track a blue whale's movements from Cape Cod to Bermuda during a 43-day period. This and other technology may assist in detecting the sound of harpoons from "treaty-breaking whalers" and the emptying of bilges from illegal chemical dumping in the seas.

The DoD has also exhibited strong leadership in planning for and promoting a two-day Environmental Security/National Security Conference in mid-1995, which was co-hosted with the intelligence community. This was considered a pivotal point in helping to frame the role of the intelligence community in supporting related policy deliberations on how environmental issues might impact national security.

The continued realization of the importance between environment and national security has led to the relatively recent establishment of the Director of Central Intelligence (DCI) Environmental Center (e.g., DEC). This new center's focus will be on environmental challenges that have a direct impact to U.S. interests (Auster, 1998). The DEC sponsored a three-day workshop of regional environmental experts in November 1997 to explore likely "environmental flash points" throughout the major regions of the world. The more important workshop findings that relate to the European region are discussed further in Chapter 5.

**Leveraging Resources**

Acting on the current administration's belief that a strong international program is crucial to U.S. security, economic, and health interest, the DoD, the DoE, and the EPA signed a Memorandum of Understanding (MOU) in July 1996 calling for partnerships between these agencies, other governments, and industry to jointly address critical environmental concerns. The need for such an agreement grew out of a mutual frustration among agencies desiring to leverage their unique expertise and resources to more efficiently address areas of similar interest on an international front (Vest, 1997), a TEAM USA concept for interagency partnership (EPA, 1998).

This MOU calls for a focused integration of government authorities, expertise and resources on environmental priorities, and also establishes a framework for cooperation in several areas. The initial emphasis will be on programs to enhance environmental cooperation between the U.S. and foreign partners to include the Baltic states, Russia, Eastern Europe, and the newly independent states of the former Soviet Union. Focus areas include: information exchange, research and development, technology transfer, regulatory reform, emergency response training, and environmental management.

The EPA and DoE, at the invitation of DoD, have been active participants on an ongoing trilateral initiative with Russia and Norway on Arctic Military Environmental Cooperation (AMEC). The AMEC focuses on military-related environmental issues impacting the Russian Arctic, to include improved management of radioactive and other hazardous materials. This is reportedly one of the foremost successes of the MOU, and expansion of this partnership to include other U.S. government agencies will be promoted once more experience is gained (Vest, 1997). The State Department is an active participant on AMEC and other regional environmental cooperative initiatives, although it is not currently a signatory to the underlying MOU.

There has also been a growing interest by the current administration to further concentrate efforts in promoting economic and environmental cooperation in Southeast Europe. This is due, in large part, to the relative volatility of this particular area. The socio-economic, political, and environmental issues contributing to this volatility will be discussed later in the paper.

## 3.4 Ecogeographical Approach

An ecogeographical approach to environmental security is also a relatively new concept (or paradigm) that encourages a broader view involving increased regional collaboration among key actors and stakeholder (Interagency Ecosystem Management Task Force (IEMTF), 1995). Westing (1989a) defines an ecogeographical region as an ecosystem or "unit made up of living and non-living components of the environment that interact to form a life-support system." This definition denotes a region that functions in a relatively cohesive and independent manner. This should not imply, however, that an ecogeographical region is totally self-contained and independent of other contiguous areas, or that its boundaries are easily distinguishable.

Ecosystem boundaries do not necessarily correspond well to the artificial boundaries imposed by the political borders of most modern nation states. Rather, physical and natural characteristics of climate and topography, biological communities, and cultural and social forces are suggested as better determinants (Caldwell, 1970, Westing, 1989b, and Byers, 1991). The complexity and dynamics associated with ethnicity, religion, and language make it particularly difficult to identify culturally determined regions and subregions (Westing, 1989b). Byers argues that understanding the incongruities between political ecogeographical borders can provide a better basis for understanding conflict.

The concept of organized nation states is relatively new, ushered into prominence only after the Peace of Westphalia in 1648 (Kaplan, 1994). Until the twentieth century, nation states only comprised three percent of the earth's land area. While most scholars do not believe cultural identities will soon replace existing nations states, transnational societal and environmental stresses are believed to have already initiated a breakdown of the boundaries of national sovereignty (Mathews, 1989). An important struggle for national identity is occurring in Russia, where Western European principles are at odds with a historic desire to remain a unique Eurasian civilization (Huntington, 1993).

Some modification to state sovereignty has been recommended as necessary to prevent ecologically-based conflict (Byers, 1991). International agreements on transboundary environmental problems are viewed as a beginning. Resistance to the ecosystem approach has stemmed from the fear that public land policies are but a "thinly veiled attempt" by the government to take over the management of private lands (IEMTF, 1995), suggesting that "all land is in some degree public" (Caldwell, 1970). The complexity of ecosystems has been offered as a more practical argument against the development of ecosystem-based land policies. It is doubtful that such policies would be any more complicated than current land ownership policies and laws (Caldwell, 1970). Advantages in applying ecosystem criteria include a holistic emphasis in thinking and the application of science in resolving disputes using administrative, versus litigious means.

Hardin (1985) makes a strong argument that one should "never globalize a problem if it can be dealt with locally," suggesting that globalization of environmental problems may actually be counterproductive. Since these problems are produced by local action the responsibility for their solution should be retained at the local level. Global air pollution is offered as one example where global solutions and institutions are warranted, but where limited sovereignty required to successfully control pollutants is believed unlikely to be given from nation states because of rational fears over the potential abuse of such power. Dilution in national sovereignty, however, is inevitable in establishing international treaties and interstate federations to address regional environmental problems (Westing, 1989b).

The European Union exemplifies the pursuit of regional economic and political security at the expense of the surrendering of limited national sovereignty by member states.

Since most conflict occurs among neighboring countries, it is suggested that regional cooperation on transboundary environmental problems will have the added benefit of fostering comprehensive regional security (Westing, 1989b). Several justifications are offered for this perspective. Regional issues are generally more clearly defined than are global issues and may offer unique solutions. The ecogeographical region is also likely to be "endowed with an ecological integrity that most nations could not achieve short of conquest." A regional approach to environmental cooperation presents opportunities for promoting a peaceful model for addressing disputes on common transboundary problems that can be easily transferred to other issues.

A river basin approach has been growing steadily in popularity as a natural unit for addressing water quality management efforts within CEE (Scheierling, 1996). Ecosystem approaches have been successfully applied internationally, as in the case of the Rhine River (Murphy, 1997a) and Great Lakes (EPA, 1990 and IEMTF, 1995). A watershed approach is being used successfully by the United States to restore and protect water quality in several major water bodies, including the Chesapeake Bay. In a recent empirical survey of integrated river basin management agencies conducted by the Organization for Economic Co-operation and Development, there has been a noticeably strong movement away from purely economic approaches to river basin management towards the resolution of environmental problems (Newson, 1997).

The Danube River Basin comprises a multitude of nation states with differing languages, religions, and ethnic groups. As will be discussed later, the concept of cultural gradient to define Europe's regions has been shown to be inconclusive, leaving one to ponder if it would be safer to use a physical and geographical categorization (Davies, 1996). This has advantages, especially since the natural components of a hydrologic unit remain constant, while political regimes have typically been unstable and short lived. The Danube River affords an important and common cultural link that has bound the region historically (Magris, 1997 and Kaplan, 1996) and could easily be exploited to improve regional environmental security (Westing, 1989b).

# 4. THE DANUBE RIVER BASIN

The Danube River Basin remains strategically important to both Western and Eastern civilizations, its main stem having served as a convenient invasion route for different armies. Over the centuries, imperial designs and control have had their unique impact on the economic, cultural, and political development of the region. This chapter provides a brief overview of the characteristics of the basin that were instrumental in this development. The concept of cultural gradients is introduced to help explain the complexity of the situation that currently exists in the Balkans, an area that lies at the confluence of several cultural and historical faults. Also addressed are major environmental issues, a Cold War legacy, which continue to impact the health of the riverine ecosystem. Upstream riparian nations are major dischargers of nutrient loadings to the Danube, and ultimately to the Black Sea.

## 4.1 Heartland of Central Europe

The Danube River and its 300 tributaries combine to make up an important aquatic ecosystem with high economic, social, and environmental value. These waters support drinking water supplies, agriculture, industry, fishing, recreation, power generation, navigation, as well as serving as a final sink for wastewaters generated by some 86 million people who live and work in the basin, approximately twelve percent of all Europeans.

The Danube drainage basin (Figure 4.1, Page 35) comprises approximately 800,000 square-kilometers, representing eight percent of the land area of Europe (Westing, 1989b). One-third of the basin is mountainous, the remainder consisting of hills and plains. Seventeen nations occupy varying fractions of the watershed: all of Hungary; a majority of Austria, Slovenia, Croatia, Slovakia, and Romania; plus significant parts of the Czech Republic, Germany, Bulgaria, Moldova, and the Ukraine. The drainage basin also includes portions of the former-Yugoslavia, Bosnia-Herzegovina, as well as small parts of Italy, Switzerland, Albania, and Poland. Table 4.1 (Page 34) provides comparative physical and population data for the Danube River Basin countries.

The Danube River originates in the Black Forest of western Germany, flowing some 2,800 kilometers across Central Europe to the Black Sea. Its course traverses four distinct major geographic regions (Environmental Programme for the Danube River Basin (EPDRB, 1995). The upper region extends from the source tributaries in Germany, east across the Bavarian Plateau, through the Austrian Alps to Bratislava, Slovakia. The middle region extends south down the Great Hungarian Plain, then east again through the mountainous Iron Gate Gorge of the former-Yugoslavia. Crossing the broad Danubian Plain, it forms the border between Bulgaria and Romania (the lower region) until it enters a reedy marshland in Romania, known as the "Danube Delta." It then discharges an average of 6,500 cubic-meters of water per second into the Black Sea, via three great arms (Bennett and Woolfitt, 1984; Westing, 1989b, and EPDRB, 1995).

## 4.2 Historical and Cultural Perspective

The importance of the Danube River Basin in European history is often overlooked or underestimated by many of today's policymakers. For centuries the river has offered an invaluable means of

# Table 4.1 - Comparative Physical and Population Data for Danube River Basin Countries

| Country | Country Characteristics (1) | | Catchment Characteristics (2) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Catchment Area | | | Catchment Populations | | |
| | National Land Area (sq. km.) | National Population | sq. km. | % of Total Catchment | % of Total National Land Area | Millions | % of Total Catchment Populations | % of Total National Population |
| Austria | 82,730 | 8 2 | 80,700 | 10% | 98% | 7.4 | 9% | 90% |
| Germany | 349,270 | 82.4 | 56,240 | 7% | 16% | 12.0 | 15% | 15% |
| Hungary | 93,000 | 10.3 | 93,000 | 11% | 100% | 10.3 | 13% | 100% |
| Czech Republic | 77,280 | 10.2 | 22,235 | 3% | 29% | 2.7 | 3% | 27% |
| Slovak Republic | 48,080 | 5.4 | 47,064 | 6% | 98% | 5.1 | 6% | 95% |
| Slovenia | 20,120 | 1.9 | 16,841 | 2% | 84% | 1.6 | 2% | 83% |
| Croatia | 55,920 | 4.5 | 34,760 | 4% | 62% | 3.2 | 4% | 71% |
| Bosnia-Herzegovina | 51,000 | 4.0 | 58,000 | 7% | 100% | 2.5 | 3% | 63% |
| Former Yugoslovia. | 102,000 | 10.4 | 75,000 | 9% | 74% | 8.0 | 10% | 77% |
| Bulgaria | 110,550 | 8.4 | 46,900 | 6% | 42% | 4.4 | 5% | 52% |
| Romania | 234,030 | 22.6 | 234,030 | 29% | 100% | 22.5 | 27% | 100% |
| Ukraine | 579,350 | 51.2 | 30,700 | 4% | 5% | 1.3 | 2% | 2% |
| Moldova | 32,970 | 4.5 | 10,360 | 1% | 31% | 1.1 | 1% | 23% |
| Other Nations: | | | 8,058 | 1% | 1% | | | |
| Albania | 27,400 | 4 2 | | | | | | |
| Poland | 304,420 | 38.7 | | | | | | |
| Switzerland | 39,559 | 7.4 | | | | | | |
| Italy | 294,060 | 57.2 | | | | | | |
| Total | 2,501,739 | 331.6 | 813,888 | 100% | 33% | 82.1 | 100% | 25% |

Notes

a IIASA study conducted a year prior to the fall of the Iron Curtain
b Countries participating in what was termed a "Central European Initiative" (CEI)
c Emission data for Croatia includes only public power plants
d Estimates based on EC and IIASA data

Source
Emissions of Air Pollutants in the Region of the Central European Initiative - 1988, Klimont et al , IIASA Status Report (SR-93-03), adapted by permission of International Institute for Applied Systems Analysis (IIASA)

# The Danube-River-Basin

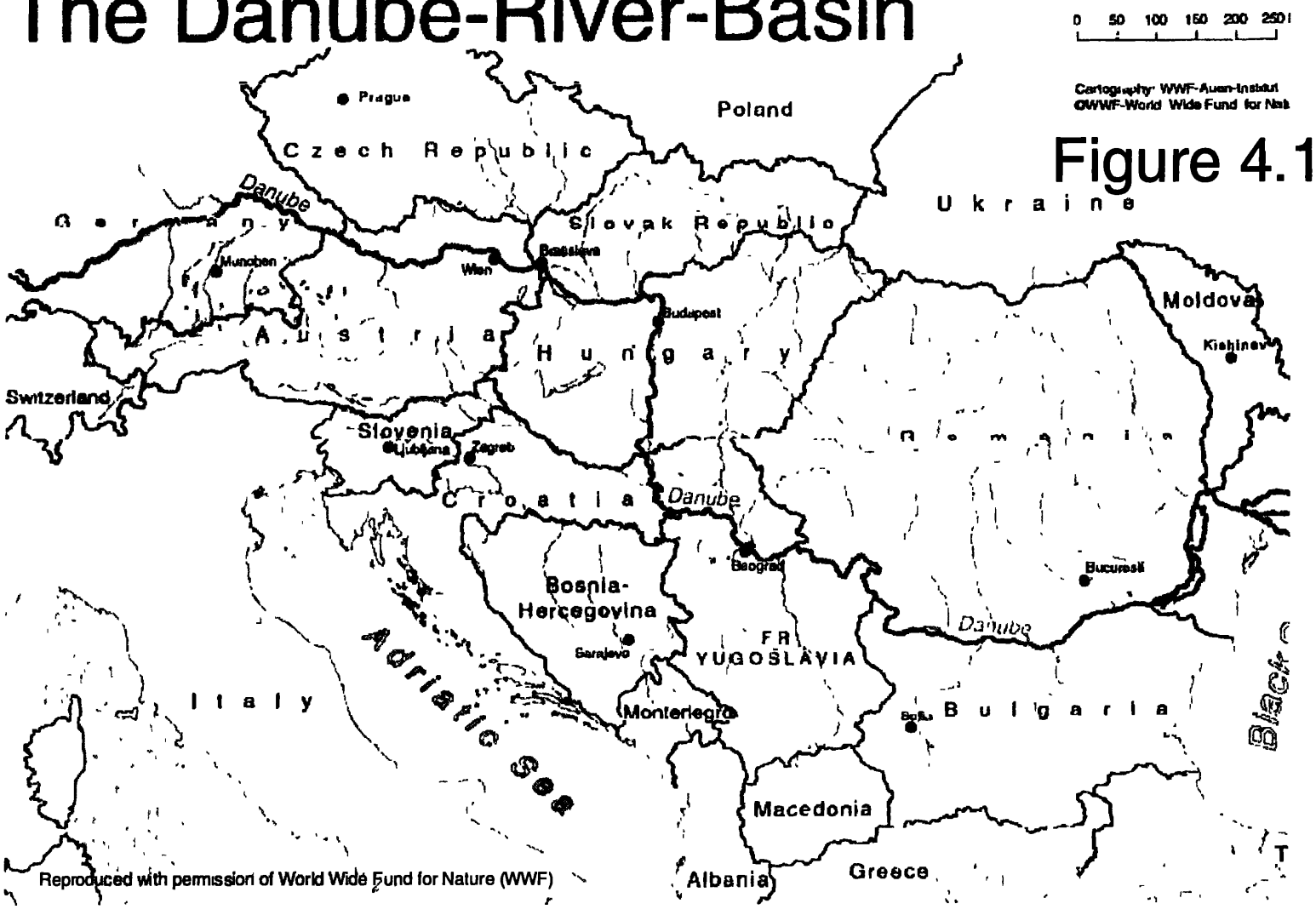



Figure 4.1

binding together disparate cultures and peoples. In this century alone, it has also served as the site for the catalytic events igniting World War I. It was a key strategic military objective of a Nazi regime dependent on land, resources, and labor to support its war effort against the Eastern Slavic peoples. The Danube River Basin also served as an important security buffer for some 40 years with the creation of Soviet-backed authoritarian puppet states following World War II. More recently, the United Nations and then NATO have intervened in peacekeeping roles to separate warring Balkan factions following the dissolution of the former-Yugoslavia. To more fully comprehend the political, socio-economic, and environmental issues confronting this region, one must first have some appreciation for the conditions that prompted development.

**Factors Impacting Early Settlement**

The European Peninsula is host to a moderating continental climate with cold winters and hot summers, as well a rich and diverse geological and biological environment that has favored agriculture. The seasonal rhythm and the environmental setting are believed to have created a stress in primitive cultures that, while presenting manageable challenges, "demanded enterprise" (Davies, 1996). Europe is linked by a network of natural pathways that allowed for its transverse by early travelers in a matter of weeks, which is significantly shorter than for the larger continents (Figure 4.2, Page 37). It has been suggested that Europe can best be viewed as five regions based on physical and geographical features: the Great (North) European Plain, the Mediterranean, mountains, large sub-peninsulas, and islands (Davies, 1996). The first three natural components have relevance to the settlement of the Danube River Basin.

The Great European Plain extends some 4,000 kilometers, and is the continent's most dominant geographical feature. Early settlements on the Plain were heavily dependent on farming. Lowlanders, more open and vulnerable to hostile factions than those in the more mountainous areas, developed cultures heavily dependent on self-protection. This resulted in the Plains initially resisting the onset of settlements, and later in the establishment of more powerful military powers on the continent, as evidenced by France, Prussia, and Russia. As might be expected, the Plain also served as the setting for some of Europe's largest and bloodiest battles. Since settlements were established first in the south and west, and last in the east across the Plain, the concept of "cultural gradient" developed (Davies, 1996).

In modern times, this has resulted in a widely held belief of a "cultural descent" as one moves from west to east. This was a basic ideological underpinning of the theory of cultural domination espoused by Nazi Germany. Many geopoliticians in the early part of this century supported the theory that the Great European Plain is the "heartland" of Europe, and whoever controls this land mass controls the sea powers (Chaliand and Rageau, 1992). Other theories have been espoused in direct conflict with this concept. However, the strategic importance of the Great European Plain to national security continued to be an important component to geopolitics and to expansionist ideas at the turn of the century and well into the early 1930s, and thus the importance of this land mass, should not be discounted.

Mediterranean civilizations have also had a pronounced impact on the cultural development of Europe. The Roman Empire reached the height of its golden age in 230 AD, with the Danube forming the empire's northern boundary along much of its length (Shafer, 1948). Traversing the Great Plain and mountain regions to the Mediterranean, one reportedly would experience a "cultural ascent" (Davies, 1996). During this period the Roman influence was such that the military effort required to ensure the security of the empire's Mediterranean holdings was at a minimum (McEvedy, 1967).

# Figure 4.2
## Geography of Central and Eastern Europe

Source Atlas of Eastern Europe, Central Intelligence Agency CPAS 90-10002, August 1990

## Table 4.2 - Qualitative Assessment of Pollutants on Water and Sediment Quality

| Effects on Water Quality | Tributaries of Danube | Danube | Danube Delta | Black Sea (c) |
|---|---|---|---|---|
| 1. Nutrients N + P | locally severe | severe (a) | severe | severe |
| 2. Metals (b) | locally | probably severe | unknown | unknown |
| 3. Micropollutants: | | | | |
| a. Pesticides (DDT, Lindane, etc.) | locally | unknown (d) | unknown (d) | unknown (d) |
| b. Others: PCBs, PAH's | locally | unknown (d) | unknown (d) | unknown (d) |
| 4. Bactena + Viruses | locally severe | severe | severe | severe |
| 5. Oil | locally | locally | locally severe | moderate |
| 6. Biologicaly Degradable Matter (BoD) | locally severe | minor | minor | minor |
| **Effects on Sediment Quality** | | | | |
| 1. Metals (b) | locally severe | moderate | unknown | unknown |
| 2. Micropollutants | locally severe | moderate | unknown | unknown |

Notes
(a) Especially Wetlands
(b) Metals cadmium, mercury, copper, nickel, lead, zinc, chromium, arsenic
(c) Danube related
(d) Data too scarce to allow for proper assessment - might be a problem

Source Danube Integrated Environmental Study, Report Phase 1, 1994, reproduced with permission of Haskoning Royal Dutch Consulting Engineers and Architects and Danube Programme Coordination Unit

## Table 4.3 - 1988 Characteristics of Emissions of Atmospheric Pollutants for CEI Countries

| CEI Countries (b) | Total Emissions | | | | Emissions per Capital | | | |
|---|---|---|---|---|---|---|---|---|
| | Sulfur Dioxide (kilotons) | Nitric Oxides (kilotons) | Particulate Matter (kilotons) | Carbon Dioxide (kilotons) | Sulfur Dioxide (kg/capita) | Nitric Oxides (kg/capita) | Particulate Matter (kg/capita) | Carbon Dioxide (kg/caplata) |
| Austria | 116 | 225 | 44 | 55 | 15 | 29 | 6 | 7 |
| Hungary | 1,171 | 231 | 222 | 84 | 113 | 22 | 21 | 8 |
| Czech Republic | 2,066 | 858 | 840 | 180 | 199 | 83 | 81 | 17 |
| Slovak Republic | 606 | 251 | 304 | 64 | 115 | 48 | 58 | 12 |
| Slovenia | 210 | 50 | 25 | 14 | 108 | 26 | 13 | 7 |
| Croatia (c) | 70 | 10 | 2 | | 15 | 2 | 1 | |
| Poland | 3,827 | 1,363 | 2,145 | 454 | 101 | 36 | 56 | 12 |
| Italy | 2,216 | 1,982 | 492 | 443 | 39 | 35 | 9 | 8 |
| Total for CEI Nation | 10,282 | 4,970 | 4,074 | 1,294 | 76 | 37 | 30 | 10 |
| Europe (d) | 40,644 | 20,546 | | 7,250 | 58 | 29 | | 10 |

Notes
a IIASA study conducted a year prior to the fall of the Iron Curtain
b Countries participating in what was termed a "Central European Initiative" (CEI)
c Emission data for Croatia includes only public power plants.
d Estimates based on EC and IIASA data

Source Emissions of Air Pollutants in the Region of the Central European Initiative - 1988, Klimont et al , IIASA Status Report (SR-93-03), adapted by permission of International Institute for Applied Systems Analysis (IIASA)

With the collapse of the Roman Empire, the Mediterranean region was never politically united and, in fact, sea power has never successfully displaced the resulting land-based empires that were established. The extensive network of Roman roads that were used as chief trade routes were destroyed or fell into ruin over the centuries. Feudalism did not promote extensive trade and thus created a general immobility during the Middle Ages of Europe. Consequently, trade became heavily dependent on water routes.

Mountains form the backbone of the European Peninsula and were important physical barriers. The Carpathians, for example, give Hungary a natural border in the east. Highland cultures also tended to develop in a more distant and independent fashion from those on the Plains. Switzerland's early development from the middle ages, and a continued strong desire to maintain its neutrality and confederation of mountain cantons today, exemplifies a concept of mountain cultural development (Davies, 1996). Important to the Danubian region are the presence of major mountain gaps such as the Bavarian Gap at the middle Danube, the Elbe Gap, the Moravian Gap, and the Carpathian Gap. These gaps have opened up early settlements to external influences while allowing easy access for outside invaders.

The Danube itself became a natural artery for invading armies, to include the hordes of Mongols led by Ghengis Khan, and later by Turkish armies moving eastward. The Danube was also, for a period spanning 200 years, a major route for the Crusaders, European armies marching eastward to recapture holy places of Christianity from Islam (LaBelle, 1996). This artery also contributed to European development and culture from an influx in Eastern arts and sciences, often from the Arab lands that the Europeans were attempting to conquer

**Imperial Influences**

The Ottoman Turks crossed the Dardanelles in the fourteenth century and became a force to contend with in Europe as their armies conquered Romania, Bulgaria, and Serbia. Continuing to advance westward they defeated the Hungarians and captured its capital in 1526, which had a lasting impact on the country's political history (Velkov and Radushev, 1996). The Turks also laid siege to Vienna in 1529, the first of many such attempts.

Turkey remained dominant in Central and Eastern Europe until the last quarter of the eighteenth century, their empire extending along both banks of the Danube from Serbia to the Black Sea (Shafer, 1948). The Ottoman Empire's focus was not on the economic development of the nations under their control. Rather, trade in surplus crops was allowed only after their own demands had been satisfied.

The Austrians freed Hungary and part of Serbia from Ottoman control in the late seventeenth century. Austria was forced to retreat from Belgrade in 1739 and never pushed further down the Danube. Austria and Russia joined forces that eventually led to the decline of Turkish control in the region. However, this alliance was short-lived, as Austrian support shifted to the Turks, fearing Russian domination of the Danubian region.

The Czar, focusing on expansion of the Russian Empire, conquered Moldova, Romania, and Bulgaria, replacing Turkey in controlling the lower Danube. In a treaty signed in 1774, Russia withdraw her forces from these principalities but was acclaimed the protector of all Greek Christians in the Turkish Empire. Further attempts to resolve differences between the Austrian and Russian Empires

divided the previous Turkish controlled Balkan States, with Russia retaining Moldova, and Romania, and Austria absorbing Serbia, Bosnia, Herzegovina and Macedonia. Austria and then England had soon secured similar concessions from Turkey. Russia, like Turkey, was disinterested in promoting trade along the entire length of the Danube. Rather, its strategic goals remained gaining control of the Dardanelles.

In a treaty signed between Austria and Russia in 1840, the Czar granted freedom of navigation for a period of ten years to all nations and agreed to improve navigation at the mouth of the Danube, of which Russia was now the master. However, since Odessa (on the Black Sea) was in competition for trade with cities on the mouth of the Danube, the Russians were little interested in completing needed navigation improvements. Russia's occupation of Romania prompted England and France to support Turkey in the Crimean War against Russian interests in the region. Navigation of the Danube was also an important underlying consideration during diplomatic negotiations. Russia sank ships to block access along the Danube, and the Allies blockaded its mouth.

The Treaty of Paris of 1856, ending the Crimean War, established a European Danube Commission. Unfortunately, it remained ineffective for some 40 years. In a treaty signed between Russia and Turkey in 1883, Russia was given free access to the Danube regions of Turkey, the Black Sea, and for the first time in some 300 years, free access to the Dardanelles (Shafer, 1948).

The Danube was a unifying force for the Hapsburg Monarchy and was important to the empire's economic survival as a cost-effective means to move food, supplies, and fuels. Austria made early attempts to regulate the rivers and, as early as the mid-eighteenth century initiated projects to improve navigation and control flooding on the river and tributaries. It is not surprising that Austria continued to push for freedom of navigation at every opportunity. Her political and economic survival were heavily dependent on this natural resource.

**Germanic Aspirations**

German aspirations toward the Danube were not believed to be of any great importance during the late nineteenth century. Rather, Prussian leadership was focused on access to the Baltic ports. The breakup of Central Europe, following the treaties of 1919-1920 ended traditional German influence in the area and resulted in the formation of nation states, mostly at the expense of the Austro-Hungarian Empire and Russia (Chaliand and Rageau, 1992).

German support to the European Commission, established following the World War I to control navigability on the Danube, was withdrawn in 1936. Romania, Yugoslavia, and Czechoslovakia also withdrew from the European Commission in the hopes of securing more political and economic independence. The result, however, was that they were only to add to the economic hardships in the region and would become easy prey to Nazi Germany, who recognized the strategic value of controlling the Danube (Shafer, 1948).

The Ukraine in the Great European Plain, and Europe's breadbasket, was one of Nazi Germany's major strategic objectives during World War II. To accomplish this, it was necessary that Central and Eastern Europe be placed under German control. The Danubian region itself was rich in agricultural lands, minerals, and other natural resources, to include Romanian oil fields. Conquest of the Slavic races to the east was also acceptable and in complete compliance with German policies supporting

Aryan superiority. Germany recognized the importance that the Danube played in maintaining the cohesiveness of the once mighty Hapsburg Monarchy. Nazi Germany assumed absolute control over all commercial shipping on the Danube by mid-1940 and forced the riparian nation states it had conquered to sign the Danube Commission out of existence. Germany substituted a Danube Committee, which it continued to dominate during the war.

The Danube became increasingly important to the Third Reich following the Battle of Britain, where England demonstrated air superiority and critical seaports were again denied. Germany became increasingly dependent upon internal transportation systems, particularly the Danube. Traffic management was made more efficient on the Danube using a master plan that provided for twenty-four hour usage; an extensive system of signals, lights, and regulations; improvements in harbor and warehouse facilities at key cities along the Danube; and the Rhine-Main-Danube connection was widened and deepened (Shafer, 1948). Control of the Danube allowed for complete Nazi domination of the Danube River Basin

**The Soviet Danubian Empire**

The advance of the Red Army into the Danube River Basin after 1945 was notably "one of the swiftest, the most bloodless, and the most complete" (Sheperd, 1954). What had been the site for centuries for mastery of this strategic valley, first by the Roman Empire, the Hapsburg Monarchy, and others was carried out by the Soviets in less than three years and without the loss of one Russian soldier. The Soviet Union's post-war strategy was to maintain a closely knitted series of states to act a buffer against further Germanic expansionism.

The degree of force used by the Soviets to subjugate the different nations varied. When the Red Army entered Romania in 1944 following U.S. bombing raids on Romanian oil fields under German control, the Romanian communist party numbered less than 1,000 (Sheperd, 1954). Within three years it was claiming a majority of popular support.

Given Hungary's geopolitical connection to the West, the Soviet Union initially resorted to less forceful means to absorb this nation state. Anti-Russian sentiment surfaced in what were considered relatively free post-war elections. This resulted in direct intervention and the threat of increasing the Red Army garrison strength in Hungary above three to four divisions (Sheperd, 1954). In contrast, no Soviet soldiers were stationed in Czechoslovakia. What had been a democratically established republic was swiftly swept away in early 1948 without a shot being fired. In subsequent elections held in 1946, the Czech Communists, in what were viewed as free elections, established themselves as the majority party. Communists, however, were beaten in elections held in Slovakia.

At first glance, Soviet control of the Danubian nation states (excluding Yugoslavia) was more accepting when viewed from a strictly ethnic and religious perspective. The majority of countries were, with the exception of a primarily Catholic Hungary and Austria, populated by fellow Slavs and by Greek Orthodox, a religion similar to Russian Orthodox. To control economic development and trade between its newly established satellite nations and the West, and to ensure its domination over the Danube Basin, the Soviets needed to control the river as the major means of transport for Central and Eastern Europe. Proposals by the United States to reopen the Danube were ignored until mid-1946. Follow-on treaties addressing improved navigability and safety were introduced in the late 1940s and 1950s.

The adverse health impacts from decades of neglecting environmental problems were used as a political rallying cry by many interest groups in the late 1980s to showcase the mistakes of the centrally planned and managed socialistic political and economic systems. This pressure was used as a political weapon and viewed as instrumental in contributing to the eventual dismantling of socialist regimes in Central and East Europe (REC, 1994 and Pearce, 1994b). After several years of addressing environmental programs in isolation from acute social and economic issues faced by the public in a majority of these countries, pro-environmental groups and politicians have exhibited more of a "wait and request" attitude (REC, 1994).

**Re-emergence of Russian and German Influence**

The long-term impact that the current economic and political situation in the Russian Federation will have on the stability of the region is unknown, especially with events developing so rapidly. Russia's citizenry has weathered similar storms throughout this century. Older generations may prefer a return to a more centrally planned economy of the past, but it appears that the majority still favors continuing closer ties to western markets, increased personal freedoms, and continued democratization. Among major lessons learned are the importance of strengthening the financial institutions that underlie a market-based economy, challenges also being faced in the current restructuring of the CEE transition economies (EBRD, 1997).

It has been suggested that Russian forces may soon return to much of the old borders of the Soviet Union through a process of the re-absorption of the Ukraine, Belarus and, over time, Central Asia and the Baltic states (Global Intelligence Update (GIU), 1998). This forecast may not be that unrealistic given the current communist and nationalist domination of the Duma and the argument that the collapse of the Soviet empire has left the country both "impoverished and insecure." Strategically, the Ukraine is dependent on Russian sources of energies and, with Belarus, remains closely tied economically. The Western investment in energy production and pipelines is also believed to be an important strategic objective in the re-absorption of Central Asia.

The importance of regional geography to earlier conquests of the Danubian region has been briefly mentioned. As history has proven, the vast Polish and Hungarian plains are not seen as defensible except at great loss of life (GIU, 1998). Since the dissolution of the Soviet Union, Slovakia has continued to maintain closer ties with Russia than with Western Europe. A Russian alliance with Slovakia and the re-absorption of the Ukraine could allow the unrestricted movement of Russian troops into CEE, a "300-mile long bayonet thrust into the heart of NATO." This would make the defense of Hungary (and Poland) very difficult and position the Danube as an important "first line of defense" (GIU, 1998). The planned expansion of NATO that would admit the Czech Republic, Hungary, and Poland, while excluding Slovakia, the Baltic states and other CEE countries, complicates an already muddied regional geopolitical situation, especially with respect to NATO and Russian relationships with nation states buffering a new "frontier."

Regional geopolitics over a century have led certain researchers to suggest that "a unified Germany always tends to destabilize Europe" (GIU, 1998). Germany faces national security threats on two major fronts: to its industrial heartland on the Rhine, and to its capital across the Great (North) European Plain (Figure 4.2). While other NATO powers are also vulnerable, most have the advantage of natural physical barriers to assist in the defense of their countries. The re-emergence of a Russian empire will have significant implications for German national security, especially if the U.S. presence

in Europe and support for the existing European Alliance does not remain strong. German dominance of European security institutions, increased military expenditures, and the stationing of defensive troops in buffering states such as Poland would likely be viewed skeptically.

**Cultural Gradients and Sub-Regions**

Several researchers have proposed the concept of major "fault lines" (Huntington, 1993, and Davies, 1996) to help in conceptualizing how different economic, cultural, and political development in Europe has occurred over time. Davies presents a simple, yet very effective illustration of how these major fault lines may have influenced Eastern and Western Europe differently. Industrialization came late to much of Eastern Europe, which has slowed the economic development of many nations. The heavy influence of the Roman, Ottoman, and Russian empires throughout history also is readily apparent.

It has been suggested that the dominating source of conflict in the future will be cultural, that is between major civilizations, and not primarily ideological or economic as it has been in the past (Huntington, 1993). This decade's Balkan conflict, resurrected soon after the end of the Cold War, can be traced in large part to fault lines based on the religious divides between Western Christianity and Orthodox Christianity and Islam. This conflict is often viewed as perplexing since it involves peoples having a common language and racial background, separated only by a religion to which many were forced to subscribe to in order to prosper under Ottoman influence.

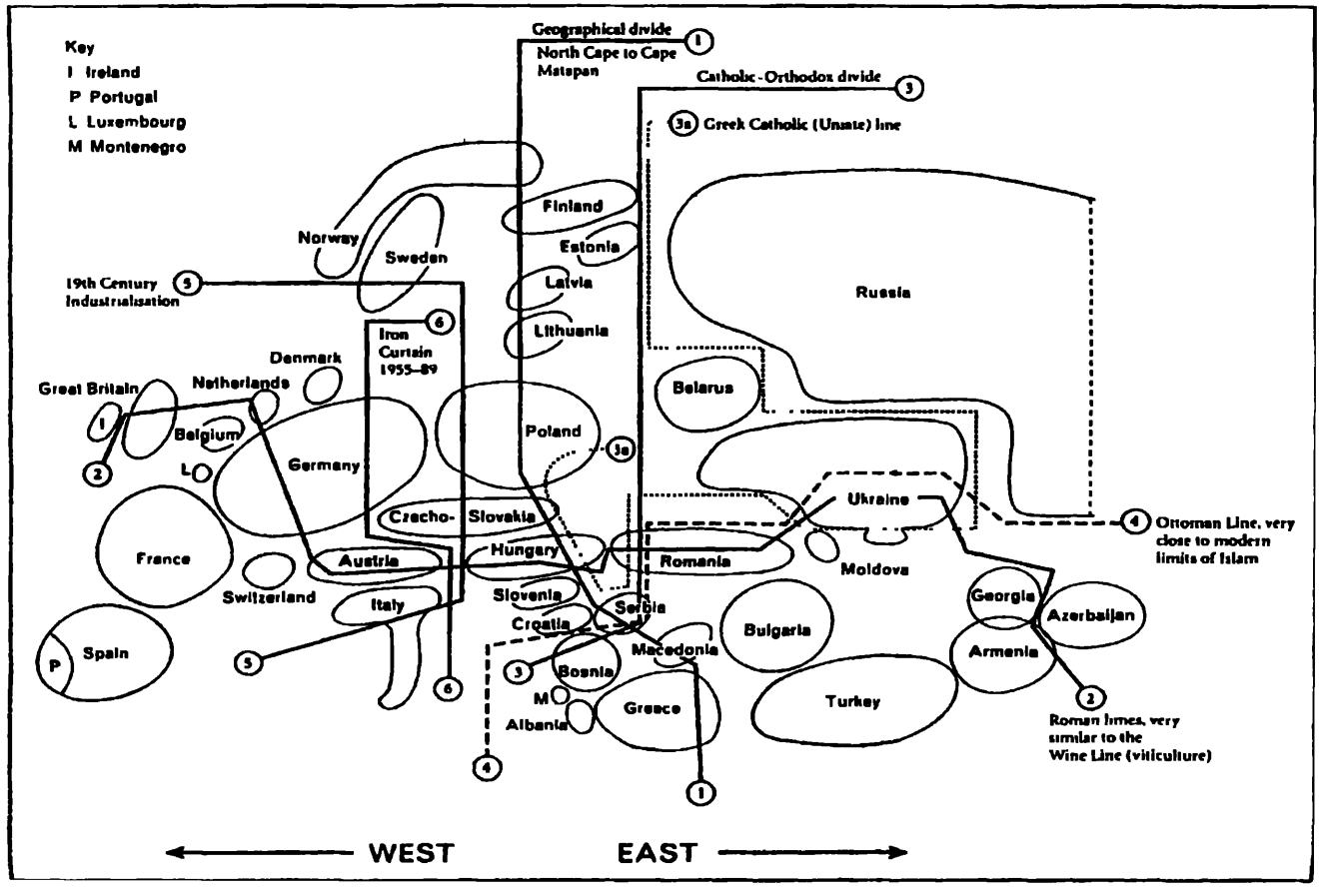
The Balkans lie at the confluence of a number of cultural and historical fault lines as shown by Davies (1996) in Figure 4.3 (Page 44). Recent ethnic conflict in the Balkans is addressed in Chapter 5.

Prior to the fall of the Soviet regime in the late 1980s, the general term "Eastern Europe" referenced the region comprising the nations of the Warsaw Pact. A number of sub-regional designations have come into vogue. The term "Central Europe" is now commonly applied to represent the more industrialized and economically advantaged nation states of the region (e.g., Poland, Hungary, and Czech Republic), further differentiating, and in a sense alienating, the more agrarian countries (e.g., Romania and Bulgaria). The latter group is currently being addressed by policymakers as "Southeast Europe."

Pirages (1997) suggests that Europe can be divided into three sub-regions based on their developmental status. "Western Europe" is viewed as those nations at the advanced stages of industrial revolution, that are more aggressively addressing environmental issues, and have low to zero population growth. "Central Europe" encompasses those nations whose industries are fueled primarily by coal, and who are currently undergoing major economic, social, and political transition (e.g., Poland, Czech Republic, Slovakia, and Hungary). "Southern Europe" would include those nations who have yet to undergo intense industrialization (e.g., former Yugoslavia, Bulgaria, Spain, Albania, Greece, and Romania).

Increasingly, international and regional institutions such as the European Bank for Reconstruction and Development (EBRD, 1997) and the World Bank (1997) have begun clustering nations of the former Eastern Europe based on their progress in transitioning to a market-based economy. This is addressed further in the following chapter and Appendix A.

# Figure 4.3 - East - West Fault Lines in Europe

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## 4.3 Major Environmental Issues

In a recent strategic action plan for the Danube (EPDRB, 1995), the most important problems directly impacting the health of this important and valuable riverine ecosystem were determined to be as follows:

- Changes in river flow patterns and sediment transport regimes;
- High nutrient loads (nitrogen and phosphorus), primarily from over-application of agricultural fertilizers - the resulting eutrophication threatens the biodiversity and economic potential of the Danube Delta and Black Sea;
- Contamination with hazardous substances and oils from petrochemical processing, iron and metal processing, timber, paper and pulp, and municipal solid waste disposal;
- Competition for available water, primarily for oversized and poorly maintained irrigation systems;
- Microbiological contamination from the discharge of urban waste, livestock, agricultural run-off; and
- Organic matter causing heterotrophic growth and oxygen depletion, originating from domestic and industrial waste treatment discharges.

The remainder of the chapter will examine the above problems in more detail, to include their impact on critical riverine habitats and delta wetlands. Air pollution will also be discussed, as it is considered one of the most serious transboundary environmental problems facing the region.

**Water Diversion**

The desire for a higher standard of living and the accompanying growth in industrialization has resulted in a proliferation of hydroelectric plants, navigation locks, and other hydraulic structures. In addition to the hundreds of artificial lakes constructed on its tributaries, there are over 47 dams and hydroelectric power plants on the Danube (Haskoning, 1994). In Romania alone, there are over 400 hydraulic structures built on tributary rivers (EPDRB, 1995).

These structures and the intensive water use in the basin dramatically influences the natural flow and sediment transport regimes in the Danube, its delta, and on the Black Sea beaches. The trapping of larger sediments (e.g., gravel and pebbles) in upper reaches, such as the Iron Gate dams, has resulted in increased erosion in the lower reaches and the deepening of river beds (World Wide Fund for Nature (WWFN), 1998). Sedimentation has also rendered riverbeds increasingly impermeable, further disconnecting surface and groundwater systems, resulting in the lowering of groundwater levels.

The construction of impoundments has also greatly decreased floodplain zones and adversely impacted habitats. The "straightening, channelization, and related navigational improvements, and the expansion of flood-control works" has hindered the self-purification processes of the natural river systems (Westing, 1989b). Intensified agriculture and the accompanying need for irrigation has re-

sulted in an acceleration in the destruction of alluvial and forested floodplains over the last 50 years. These ecosystems are important as natural filters for pollutants and for control of soil erosion and flooding.

**Water Quality**

In the early 1950s, countries under communist rule in CEE underwent massive industrialization. The locating of factories and plants was politically driven, and centrally planned, with little consideration given to the impact to human health and the environment. The continued operation of these aging and inefficient physical plants has led to rising levels of industrial pollutants, such as heavy metals and oils. Intensified agriculture has resulted in excess nutrients and pesticide residues. Many of these contaminants are swept downstream into the Danube Delta and the Black Sea becoming a problem for both of these valuable ecosystems.

The yearly loading of sediment discharged by the Danube into the Black Sea is estimated between 25 to 80 million metric-tons, of which 98 percent is suspended material (EPDRB, 1995). In addition to sediments, the Danube and Dnieper rivers discharge some 3,870 metric-tons of nitrogen compounds, 810 metric-tons of petroleum products, 540 metric-tons of lead, and 180 metric-tons of detergents a year from industrial wastes into the Black Sea (Land, 1992a).

The Danube is responsible for more than half of the total nutrient load to the Black Sea (Hinrichsen, 1994), a load four to five times larger than that three decades ago. The total nitrogen and phosphorus loadings into surface waters of the Danube are estimated at 630 and 61 kilotons a year, respectively (Haskoning, 1994). The Black Sea Environmental Program (BSEP) currently estimates that 53 percent of total nitrogen, 66 percent of total phosphorus, and 75 percent of biological oxygen demand (BOD) is attributable to the Danube (BSEP, 1997). These pollutants, and a strong density stratification which inhibits vertical mixing, has resulted in a "permanent anoxia" within 87 percent of its volume, making the Black Sea the world's largest anoxic basin (NATO, 1998c).

There is also a notable lack of reliable studies on hazardous substances contamination of water bodies and their sediments (EPDRB, 1995). Sediments associated with the various impoundments and major reservoirs downstream from heavily industrialized areas pose very serious concerns. Hinrichsen (1994) reports that aquifers along the river have been contaminated with heavy metals, nitrates, and organochlorines. No consistent basin-wide characterization of the water quality of the Danube or its tributaries has yet been conducted because of a lack of uniform classification systems among the basin countries.

The Equipe Cousteau (formerly the Cousteau Society), under contract to the European Bank for Reconstruction and Development (ERBD), conducted a two-year effort to evaluate the impacts of pollution, navigation and transport, and energy demands on the Danube and its alluvial floodplains (EBRD, 1993). The European Commission also commissioned an integrated study to assess the impact of both point and diffuse sources of pollutants, using available information from 1990 and 1991 (Haskoning, 1994). This latter study, served as a valuable baseline in the subsequent preparation of a strategic plan for the Danube (EPDRB, 1995) but admittedly suffers from "gaps in knowledge." The study also presented a summary qualitative assessment of the effects that key categories of pollutants are believed to have on water and sediment quality of the Danube, its tributaries, its delta, and the Black Sea (Table 4.2, Page 38).

Nutrients, nitrogen and phosphorus, are normally not pollutants of concern in naturally occurring concentrations. Elevated levels of nutrients, however, are a major contributor to eutrophication, resulting in increased algae growth, depletion of oxygen, and a disruption of the normal food chain, presenting a "severe" threat to the Danube, to its delta, and to the Black Sea.

Germany, Austria and Romania are major contributors to total nutrient loadings into surface water, as is the agricultural sector (Figure 4.4, Page 48). Fertilizer demand in CEE countries is expected to increase, especially for phosphorus, over the next five years, thus, increasing the loadings from diffuse sources. Over-fertilization remains a major concern, prompting the need for educating farmers in the region. As sewerage systems are extended in CEE countries there will also be a resulting increase of nutrients into surface waters.

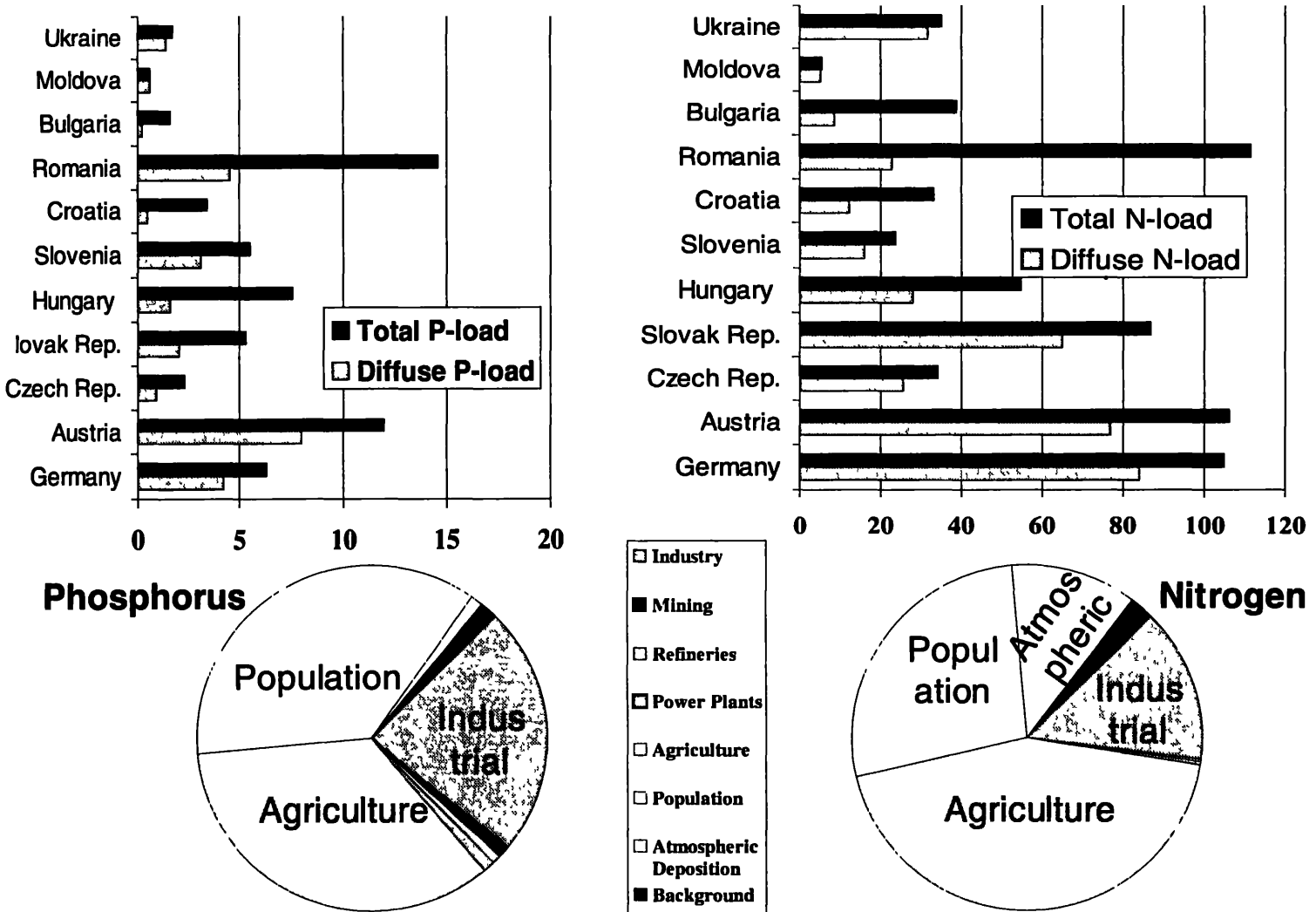
Insufficient data is available on metal emissions to prepare quantitative balances for point and diffuse sources (Haskoning, 1994). Primary point sources were found to be mercury originating from ore treatment and the chlorine producing industry; zinc from electroplating and the pulp industries; chromium from waste treatment discharges from tanning, electroplating, and textile industries; cadmium from electroplating, printing, and photographic industries; and lead from metallurgical plants. Diffuse sources of metals emissions originating from atmospheric deposition and phosphate fertilizers include cadmium, lead from traffic and industrial air emissions, and copper and zinc from atmospheric deposition. Heavy metal contamination of sediments in reservoirs created by dams is viewed as a major problem in the future.

Trace metals in Danube sediments reportedly span a wide range of concentrations similar to other polluted European rivers. In an earlier study along the main stem of the Danube, Equipe Cousteau conducted an analysis of organic and inorganic pollutants at some 50 sediment sampling sites, supported by macrozoobenthos monitoring of bivalve species at ten sites. These sites are reflective of those identified for monitoring in accordance with the 1985 Bucharest Declaration; those near the confluence of main tributaries; and those adjacent cities, industries, nuclear power plants, and dams.

The Cousteau study compared trace metals in Danube sediments with those in the lower Rhine and the limits for North Sea disposal. The relative location of trace metal hot spots found along the main stem of the Danube is presented in Figure 4.5 (Page 49). Generally, the levels of trace metal contamination were reported to be significantly higher in the sediments of downstream reaches. In the case of mercury, the level found exceeded the limits for North Sea disposal at the time by a factor of seven (EBRD, 1993). Given problems with consistent monitoring for metals it was difficult to predict future trends, although loadings were expected to increase with expansion in industrial, transport, and energy capacities.

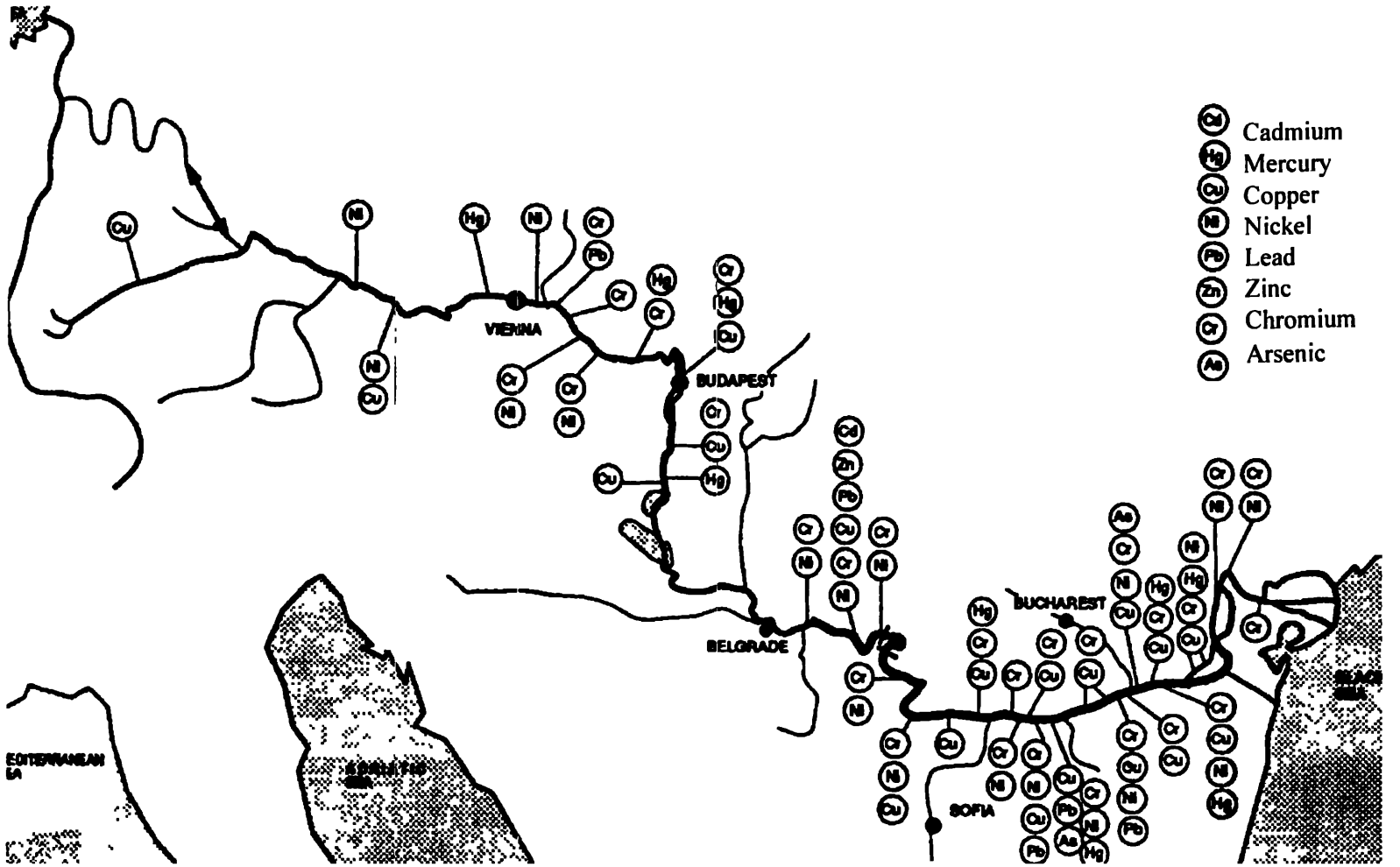
The Cousteau study also presented a similar comparison for the concentration of chlorinated hydrocarbons found in Danube sediments. Interestingly, with the exception of the pesticide lindane, the range of pollutant concentrations was generally found to be lower than those of the Rhine and other comparable rivers. Concentrations of pesticides in sediments show a marked increase, in some cases up to 50-fold, from the upper to the lower reaches of the main stem of the Danube. A similar trend of increasing levels of pesticides with downstream stations was also reported from the bivalve sampling and analysis. The expectation is that pesticide usage will parallel the increased use of fertilizer usage unless agricultural practices or policies are changed.

## Figure 4.4 - Nutrient Loadings (k/ton years into surface waters)




Source
Danube Integrated Environmental Study, Report Phase 1, 1994, reproduced with permission of Haskoning Royal Dutch Consulting Engineers & Architects and Danube Programme Coordination Unit

## Figure 4.5 - Location of Trace Metal "Hot Spots"

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The Danube For Whom and For What? - Final Report to European Bank for Reconstruction and Development, Equipe Cousteau, 1993, reproduced by permission from Equipe Cousteau/The Cousteau Society

Conversely, there was no similar trend found for polychlorinated biphenyls (PCBs), albeit there were noticeable hot spots found around large cities and industries. Given the lack of sufficient consistent emission data among Danubian countries, upgrading of the monitoring of micropollutants in sediments, surface and ground waters, and macro-benthos organisms has been urgently recommended (Haskoning, 1994).

Sediment analysis for petroleum hydrocarbons suggest three distinct areas along the Danube having noticeably elevated concentrations (EBRD, 1993). Specifically, the upper reach in Germany, the middle reach from the Austrian-Slovakian border to below Budapest, and the lower reach along the heavy industrial areas of Bulgaria and Romania. A conflicting perspective is presented in a later report (Haskoning, 1994), which suggests petroleum hydrocarbons are virtually absent in German and Austrian surface waters because of the collection and treatment of waste oils and less intensive shipping in the upper reaches of the Danube.

The Haskoning (1994) study concludes that the lower reach of the Danube is chronically polluted from industrial discharges and more intensive shipping. The study, however, emphasizes concerns with the different analytical techniques reflected in the different country reports, making a comparison difficult. Further, the study suggests that increased petroleum contamination may be attributed to the opening of the Main-Danube Canal, connecting the North Sea to the Black Sea. Reportedly, the Danube contributes approximately half of the total oil pollution to the Black Sea, some 110,840 tons annually. By comparison, the annual average pollution from accidental oil spills is 136 tons (BSEP, 1997).

Organic matter discharged into surface water is a source of food, which results in the heterotrophic growth of microorganisms and oxygen depletion. The discharge of organic matter, as measured by biochemical oxygen demand (BOD), is a problem for many tributaries (EPDRB, 1995). Interestingly, water quality in the main stem of the river, in terms of BOD and oxygen concentration, is generally good. In fact, water quality of the Danube shows improvement with downstream stations, which is attributed to its dilution and self-purification capacity (EPDRB, 1995). Most population centers reportedly lack adequate sewage treatment. High BOD loadings are localized around cities and industries with inadequate waste treatment systems (Haskoning, 1994).

There was no noticeable deterioration of water quality caused by bacteria and viruses as the Danube flows toward its mouth. However, lack of systematic monitoring data, and known or suspected localized pollution downstream from major cities, storm sewer outfalls, and especially from diffuse sources such as agriculture (e.g., manure run-off) has led to a recommendation that bathing in the Danube be discouraged (Haskoning, 1994). It is unclear what the impact of constructing or upgrading waste treatment plants will have in controlling bacteria and viruses, if corresponding attention is not given to controlling diffuse sources of pollution.

Low-level radiation is emitted under normal operations and some hot spots have been identified at existing and abandoned uranium mines. An earlier study, following the 1986 Chernobyl accident (Rank et. al, 1990), found that the content of Cesium 137 (Cs-137) in freshly deposited sediments in Austrian reservoirs rose by two orders of magnitude, with elevated levels in other radionuclides. The Strategic Action Plan (SAP) (EPDRB, 1995), however, suggests that there are few indications that radiation is causing major problems in the basin.

Earlier aerial gamma spectometry studies were conducted along the length of the Danube and around nine nuclear and non-nuclear sites (EBRD, 1993). It was observed that Cs-137 radioactivity attributed to Chernobyl decreased along the whole stretch of the Danube, varying only by levels of natural radionuclides. Radiological contamination was observed at the Kozloduy, Bulgaria nuclear power plant, localized around two drainage channels fed from a sewage works, which is now closed. Although the contamination is believed contained, there is concern for some continuing leakage and, thus, the recommendation for taking precautionary actions to erect fencing to restrict access.

Protection of groundwater resources within the Danube River basin is of particular importance, especially by those downstream riparian nations where millions are dependent upon shallow wells for their drinking water supplies. Shallow groundwater pollution could also put deeper groundwaters at risk. The karstic geology of much of the region has resulted in unique ecosystems but makes it difficult to define topographical areas to be protected. Typical contaminants whose legal limits are frequently exceeded include: nitrates, phosphates, chlorides, sulfates, ammonia, and phenols (EPDRB, 1995). The contribution of nutrients in groundwater is expected to rise (Haskoning, 1994).

**Biodiversity and Habitats**

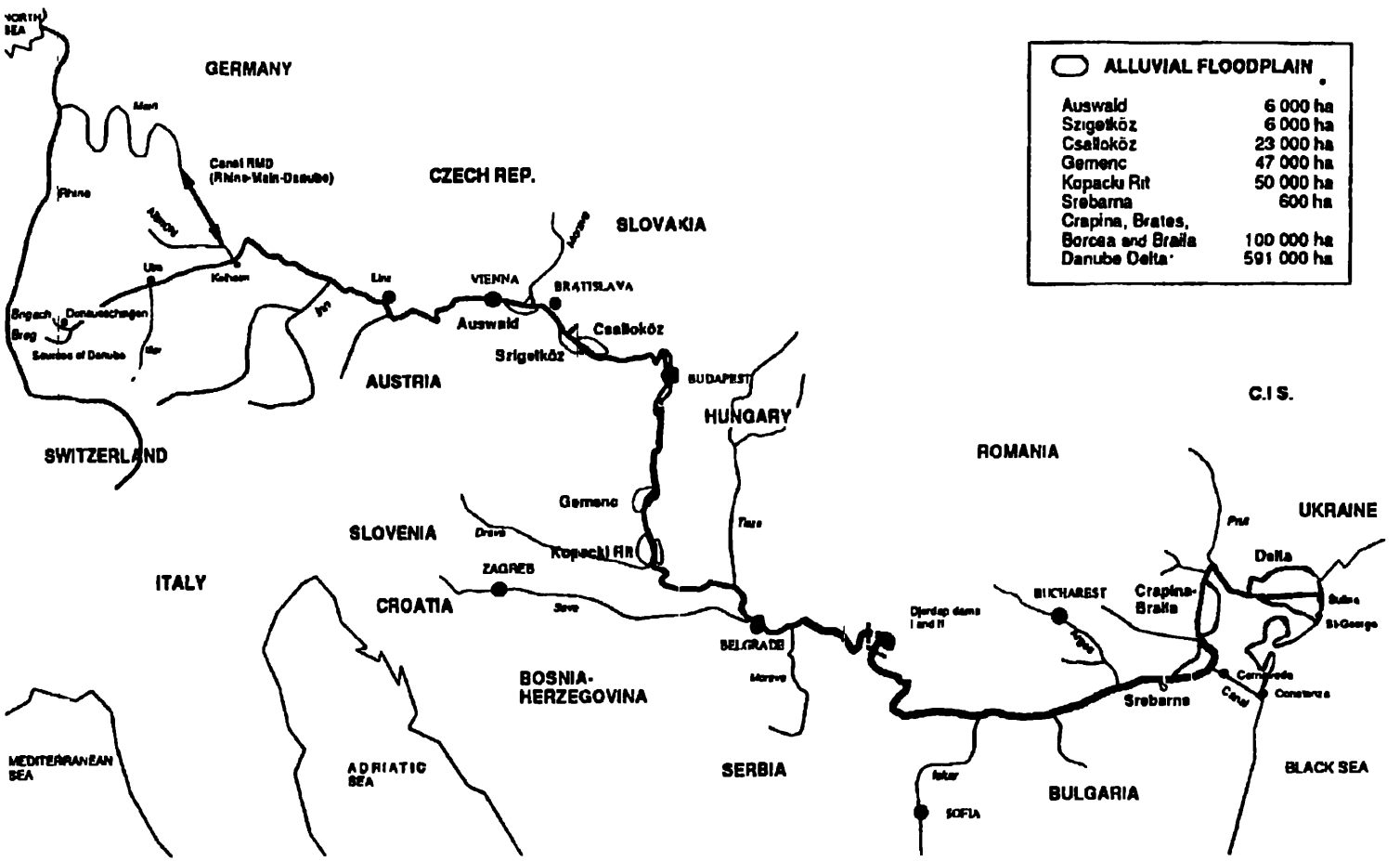
Considerable attention has been placed on environmental "hot spots," rather than on the protection of environmental "assets," which are still very much intact within the region. In addition to the traditional resources of mineral deposits, energy, forests, etc. that have significant and quantifiable economic value, recreation, scenic landscape, and biodiversity cannot be ignored as contributing significantly to the future economic prosperity of the region. Deforestation is also of concern to many CEE countries and has been attributed to both air and water pollution, intensive logging for fuel by local communities, and by dry weather which has promoted conditions for recent extensive fires (REC, 1994).

The dependency of centrally planned economies on heavy industries have had one positive legacy, that of leaving large sectors of the region untouched by industrial development. It is estimated that pristine nature areas cover some 30 percent of CEE countries, containing the greatest biodiversity in the continent (REC, 1994). With the influx of new industries, the fear is that these pristine resources will not be adequately protected.

Wetland ecosystems are important to biodiversity in the Danube basin. These alluvial floodplains and forests play a key role, serving as natural filters for pollutants and for the control of soil erosion and flooding. The terrestrial and aquatic biota found in alluvial floodplains and forests are efficient in their ability to assimilate nutrients and organic matter. These valuable habitats have undergone an accelerated destruction over the last 50 years, as lands have been drained to support intensified agriculture. Industrial pollution has also contributed to their destruction. While some of Europe's most productive areas, these wetlands (Figure 4.6, Page 52) constitute less than one percent of the Danube basin (EBRD, 1993).

An economic natural resource crucial to the survival of millions of migrating birds is the Danube delta. This 4,152 square-kilometer wetland is a center of biological diversity. It ranks as the second largest delta in Europe (Danube Delta Research and Design Institute (DDRDI), 1997) and is believed the largest interconnected reed bed in the world (WWFN, 1998). The Delta is a reflection of regional environmental problems, its degradation caused, to a great extent, by eutrophication from the cumulative inflow of nutrients from the Danube River and its tributaries and the manipulation of water dis-

# Figure 4.6 - Most Important Alluvial Floodplains




Sources
(1) The Danube For Whom and For What? - Final Report to European Bank for Reconstruction and Development, Equipe Cousteau, 1993, reproduced by permission from Equipe Cousteau/The Cousteau Society (2) A European Lifeline, Green Danube, World Wide Fund for Nature (WWF), 1998, Journal No 3

charge (EPDRB, 1995). Retention of the natural buffering capacities of up-river wetland and floodplain systems is important to its protection and to promoting biological diversity. Pringle et al. (1993) also list the elimination of the Danube's floodplain in the nations that abut the river as a significant root cause of environmental decline in the delta.

The Danube Delta supports some 75 different species of fish and provides a winter haven for several globally threatened birds (e.g., red-breasted goose, the Dalmatian pelican, and the pygmy cormorant) (EPDRB, 1995). However, wetland habitats have been significantly altered over the last 50 years. In recent decades, a system of canals was constructed to improve circulation of water through the delta. Over a third of the original ecosystem has been converted to agriculture, fishponds, orchards, or been developed (Hinrichsen, 1994). The altered network of canals cut many areas off from the river's natural water level fluctuations, disrupting the water balance and the interdependent ecosystems (DDRDI, 1997). The canals allow nutrients to pass freely through the Danube Delta rather than being retained and treated by natural processes.

Over 80 percent of the delta is located in Romania. To protect this valuable natural resource, this Romanian portion was declared a Biosphere Reserve in 1990 and registered under the Ramsar Convention (DDRDI, 1997). Additionally, over half of the Danube Delta is listed under the World Heritage Convention. A Global Environmental Facility (GEF) project is underway to conserve biodiversity in the Danube Delta and to assist in the restoration of some wetland areas to increase its nutrient filtering capacity.

The Ukranian section has received less international interest than the Romanian side, with a small GEF biodiversity project only recently initiated (World Bank, 1994). The Kiliya branch forms the border with Romania, encompassing some 150,000 hectares comprising a large number of islands, marshes, and tributaries. Approximately ten percent of the Ukrainian portion of the Danube Delta is protected, the remaining 135,000 hectares used for agriculture, supporting a population of some 68,000, compared to 15,000 on the Romanian part of the delta (EPDRB, 1995).

Interest in protecting these natural habitats increased after the fall of the Soviet regime and with greater access to the CEE countries, beginning in 1989. The World Wide Fund for Nature (WWFN) was instrumental in promoting conservation and restoration of floodlands along the mainstem and delta in a program entitled the "Green Danube Programme" (WWFN, 1998 and DDRDI, 1997). The focus is on five model projects in Germany, Austria, the Slovak, and Czech Republics, Hungary, Bulgaria, and the Danube Delta (Romania and Ukraine) (Figure 4.6). These regions are believed crucial for the survival of the Danube (WWFN, 1998). These unique and complex alluvial ecosystems were also identified as being seriously threatened (EBRD, 1993).

**Air Quality**

One of the most serious transboundary environmental problems facing the region is from air pollution, in particular from the burning of low-grade coal for heavy industry and for domestic heating (REC, 1994). A majority of industries still lack modern technologies to control air emissions. Industrial air pollutants, to include heavy metals, have the propensity for impacting downstream countries. Consequently, protection of water resources is seen as a higher priority in southern CEE countries, especially the Balkans (EPDRB, 1995 and REC, 94). Air pollutants from a rapid growth in the use of passenger cars appear to be more of a concern in the cities of upstream countries.

Given the difficulty in avoiding airborne pollutants, a recent study suggests that air pollution is likely a greater threat to CEE than polluted water (Hertzman, 1995). Lead emissions from lead and zinc smelters and leaded gasoline, airborne dust from household coal burning, and sulfur dioxide and other gases from power and industrial plants are believed to have the greatest impact on human health in CEE. The same report suggests that nitrates in drinking water and other waterborne contaminants are less prevalent or more difficult to establish cause and, thus, should be viewed as secondary pollutants.

The first consistent inventory of emissions of sulfur dioxide, nitrogen oxides, particulate matter, and carbon dioxide was conducted by the International Institute for Applied Systems Analysis (IIASA) for 1988. This was a year prior to the fall of the Iron Curtain and the restructuring of the former planned economies (Klimont et. al, 1993). The study was done as part of a Central European Initiative (CEI) with Austria, Italy, Croatia, Czech and Slovak republics, Hungary, Slovenia, and Poland. While previous estimates were based on Western European experiences and literature studies, the IIASA study made use of available national and regional statistics and information from collaborating institutions. Given the differences in national databases, it was necessary to convert data into a common format used by the European community.

The IIASA study concluded that Central European air emissions contribute substantially to the continent's total emissions, primarily due to high population densities and to the intensive use of solid fuels without appropriate emission controls (Klimont et. al, 1993). Some 70 percent of sulfur dioxide emissions originate from the burning of brown and hard coal in the CEE countries studied. In Austria, where solid fuels are typically imported, the figure is only 20 percent. Alternative fuels would significantly decrease emission in those countries where domestically available solid fuels are currently being used to a large extent, such as in the Czech Republic and Poland. The contribution of total nitrogen oxides and carbon dioxide loadings from Western European countries to the CEI region was also found to be markedly higher than their corresponding contribution of sulfur dioxide and particulate matter loadings from air emissions.

The need for additional efficiencies in CEE air emission controls becomes apparent when comparing the lower emissions per capita of Western Europe with the notably higher values for many CEE nations (Table 4.3, Page 38). A similar relationship exists when comparing emissions per gross national product (GNP). It was also found that area source emissions in the CEI region, excluding peaks in densely populated cities, have little variability. Large point sources dominate total regional emissions, particularly in the Czech Republic and Poland. About half of the large point sources identified in the CEI inventory are public power plants.

Generally, increased sulfur oxide emissions are found in those countries heavily dependent on coal and oil-burning power plants and industries, while increased nitric oxides from combustion processes can be found where automobile usage is also high (Pirages, 1997). CEE nations have typically used public transportation twice that of western countries, resulting in a much lower density of road networks (EBRD, 1993). With the transition to market economies in the CEE region, automobile usage is expected to increase, as will the supporting infrastructure. The resulting impact is expected to be a reduction of atmospheric carbon emissions and increased nitrogen loadings (Haskoning, 1994).

Consequently, acid precipitation is expected to remain a chronic regional problem, especially given the transboundary nature of the pollutants. Acid precipitation is also a major contributor to the deforestation and degradation of water ecosystems in the region. (EPDRB, 1995). The relative contribution of total phosphorus and nitrogen loadings from atmospheric deposition is 1 percent and 12.1 percent, respectively (Haskoning, 1994).

A computer simulation model called the Regional Acidification Information and Information and Simulation model (RAINS) was developed by IIASA, which marks the first time that such a model has been accepted by all parties. It includes all European countries and the United States, to a major international negotiation (Amann, 1993). Specifically, RAINS is being used as a key tool to measure sulfur emissions to comply with a sulfur emission reduction protocol to the 1979 Convention on Long-range Transboundary Air Pollution.

The impact that carbon dioxide emissions will have on climate change is of international concern. Global warming is expected to have significant adverse impacts on Southern Europe (e.g., Spain, Italy, and Greece). Desertification is a major environmental issue threatening Spain. Interestingly, the higher temperatures associated with global warming could actually benefit some CEE countries by extending the growing season and increasing humidity, thus increasing agricultural yields (Clark, 1995). The transition from heavily polluting industries to more service-based economies, and the conversion to more efficient energy fuels and practices, will likely reduce the level of greenhouse gases in the CEE region in the coming decades.

# 5. REGIONAL ENVIRONMENTAL SECURITY ISSUES

The major environmental problems that are adversely impacting the Danube riverine ecosystem were discussed in the previous chapter. There are, however, a number of socio-economic, cultural, and security issues that are believed to have the potential to cause significant environmental damage and instability within the Danube River Basin. These environmental security issues are listed in Table 5.1 (Page 57). Each issue will be discussed in detail in this chapter, following a review of two assessments focused more broadly on Europe.

## 5.1 Identification and Prioritization

Several recent initiatives identify and rank the major environmental problems confronting the European continent. Most recently, in preparation for the fourth meeting of European Environmental Ministers in Aarhus, Denmark in June 1998, a second assessment of Europe's Environment was developed (European Environmental Agency (EEA), 1998). This effort updated the comprehensive Dobris assessment of 46 countries, which had used 1992 as a baseline year (EEA, 1995). The second assessment concentrated on progress made on twelve key problems areas identified in the earlier Dobris report (Table 5.1), issues not that dissimilar from those also facing the United States (Pirages, 1997). The assessment also distinguishes between progress made in policy development and the progress toward improving the quality of the environment, which admittedly often lags behind policy development.

In late 1997, the Director of Central Intelligence (DCI) Environmental Center (DEC) sponsored a three-day workshop that brought together over 180 experts from academia, NGOs, and both private and government sectors to address the potential for environmental stress in different regions around the world. Eight regional work groups received a working paper that had been prepared by a leading expert on that specific region's environmental security issues. Each of the work groups presented the results of their efforts at the concluding plenary session. The proceedings comprised the initial regional papers revised to reflect input received during work group discussions. The key environmental stressors identified for the European Region (Pirages, 1997) are also shown at Table 5.1.

The environmental stressors identified by both of the above efforts compare closely with those identified by this paper for the Danube River Basin. Atmospheric, chemical, and waste problems addressed in the Dobris assessment are not categorized in this paper as separate environmental security issues. Rather, their relative impact is appropriately addressed in the following discussions of regional environmental security issues.

## 5.2 Economic Transition

The Danube River Basin comprises a majority of "countries in transition" that are in differing stages of restructuring their respective political, social, and economic systems from centrally planned and managed to market-driven enterprises. Most transition economies are now growing, facing increasing competition internal to the region and from foreign competitors. There are currently ten applicant countries that are aspiring to join the European Union (EU), four of the most promising being the Czech Republic, Hungary, Poland, and Slovenia (EBRD, 1997). Economic competition and European Union accession may help drive environmental protection in a positive direction.

## Table 5.1: Major Regional Environmental Stressors and Security Issues

| Environmental Security Issues Identified for the Danube River Basin | Environmental Stressors | | |
|---|---|---|---|
| | Danube Strategic Action Plan | European Environmental Assessment | Environmental Flash Points Workshop |
| Economic Transition | 2,3,5,6 | 1-8,10,11 | 1,5 |
| Energy Dependencies and Efficiencies | 1 | 1,3,8 | 3,4 |
| Water Availability | 4 | 8,11 | |
| Waterways as Economic Arteries | 1 | 11 | |
| Ethnic Conflict and Ecoterrorism | | 12 | 6 |
| Environmental Disasters | 3,6 | 12 | 4,6 |
| Regional Demographics | | | 2 |

| **Major Environmental Issues Identified in Danube Strategic Action Plan** (EPDRB, 1995) |
|---|
| 1. Changes in River Flow Patterns and Sediment Transport Regimes. |
| 2. High Nutrient Loads (Nitrogen and Phosphorus) - Impacting Delta and Black Sea |
| 3. Contamination with Hazardous Substances and Oils from Industries |
| 4. Competition for Available Water - Inefficient and Poorly Maintained Systems |
| 5. Microbiological Contamination from Urban Waste, Livestock, Agricultural Runoff |
| 6. Organic Matter from Domestic and Industrial Waste Discharges and Oxygen Depletion |

| **Priority Environmental Problems - European Assessments** (EEA, 1995, 1996, and 1998) |
|---|
| 1. Climate Change |
| 2. Stratospheric Ozone Depletion |
| 3. Acidification (Reduction of Sulfur and Nitric Oxides) |
| 4. Tropsopheric Ozone Depletion and Smog |
| 5. Chemicals (Emissions) |
| 6. Waste (Solid and Hazardous) |
| 7. Nature and Biodiversity |
| 8. Inland Waters (Use and Quality) |
| 9. Marine and Coastal Environment |
| 10. Soil Degradation (Contaminated Sites, Erosion, etc.) |
| 11. Urban Environment (Stressors from Rapid Increase in Private Transport and Consumption) |
| 12. Techological and Natural Hazards |

| **European Environmental Challenges - Environmental Flash Points Workshop** (Prague, 1997) |
|---|
| 1. Remediation Costs |
| 2. Greying of Population - Vulnerability to New Pathogens |
| 3. Resource Flows - Energy |

## Table 5.2: Economic Indicators of Transition Countries in Danube River Basin in 1995

| Country | GDP ($billions) (1) | GDP per capita ($) | Private Share of GDP (%) | Unofficial Economy (% GDP) | Growth in Real GDP (%) | Estimated Level of GDP in 1996 (1989=100) | General Govt. Balance (% Change) |
|---|---|---|---|---|---|---|---|
| Hungary | 43.7 | 4,286 | 75 | 29 | 1.5 | 86 | -6.5 |
| Czech Republic | 44 8 | 4,814 | 75 | 11.3 | 5 9 | 89 | 0 4 |
| Slovak Republic | 17.4 | 3,230 | 75 | 5.8 | 6.8 | 90 | 0.1 |
| Slovenia | 18.6 | 9,372 | 50 | | 4.1 | 95 | 0 |
| Croatia | 18.1 | 3,786 | 55 | | 1.7 | 70 | -0.9 |
| Bosnia-Herzegovinia | | | | | | | |
| Former Yugoslovia | | | | | | | |
| Albania | 2 1 | 745 | 75 | | 8.9 | 85 | -10 |
| Bulgaria | 12.4 | 1,538 | 50 | 36.2 | 2.1 | 67 | -6.4 |
| Romania | 35.5 | 1,573 | 60 | 19.1 | 7.1 | 88 | -2 6 |
| Ukraine | 80.1 | 723 | 50 | 48.9 | -11.8 | 39 | -4.9 |
| Poland | 117 7 | 3,055 | 65 | 12.6 | 7 | 104 | -3.6 |
| Moldova | 3.5 | 392 | 45 | 35.7 | -3 | 35 | -5.7 |

| Country | Annual Average Consumer Price Inflation | Unemployment (% of Labor Force) | Current Account ($millions) | Trade Balance ($millions) | Net Foreign Direct Investment - FDI ($millions) | Cumulative FDI for 1989 to 1996 ($millions) | Total External Debt ($millions) | Official Development Assistance from 1993 to 1995 (1) |
|---|---|---|---|---|---|---|---|---|
| Hungary | 28 | 10 4 | -2,500 | -2400 | 4,410 | 13,260 | 31,700 | 36 |
| Czech Republic | 8 | 2 9 | -1,400 | -3,700 | 2,720 | 7,120 | 17,200 | 129 |
| Slovak Republic | 7 | 13.1 | 390 | -230 | 134 | 623 | 5,680 | 74 |
| Slovenia | 9 | 13 9 | -40 | -950 | 170 | 743 | 3,000 | |
| Croatia | 4 | 14.5 | -1,710 | -2,880 | 81 | 615 | 3,600 | |
| Bosnia-Herzegovinia | | | | | | | | |
| Former Yugoslovia | | | | | | | | |
| Albania | 6 | 13 9 | -181 | -474 | 70 | 298 | 667 | 203 |
| Bulgaria | 33 | 10.5 | -59 | 120 | 82 | 425 | 10,229 | 128 |
| Romania | 28 | 9 9 | -1,732 | -1,605 | 404 | 1,186 | 6,710 | 193 |
| Ukraine | 182 | 0.5 | -1,500 | -2,300 | 300 | 300 | 8,100 | 310 |
| Poland | 22 | 14 9 | 5,500 | -1,800 | 1,134 | 5,398 | 43,900 | 2,203 |
| Moldova | 24 | 1 4 | -146 | -55 | 73 | 161 | 671 | 48 |

Notes. a Years shown are for 1995 unless otherwise indicated

b Source shown is Transition Report 1997 (EBRD, 1997), unless otherwise stated

Sources (1) World Resources 1998-1999 - A Guide to the Global Environment, 1998, Oxford University Press, copyright 1998 WRI, data tables adapted by permission of World Resources Institute (WRI) (2) Transition Report 1997 - Economic Transition in Eastern Europe and the Former Soviet Union, 1997, Litho-Tech Colour Printers Limited, copyright EBRD 1997, adapted by permission of the European Bank for Reconstruction and Development (EBRD)

# Table 5.3: Expenditures on Environment, Health, Social Services, and Defense

| Country | Pollution Abatement and Control Expenditure as % GDP (a)(1) | Central Government Budget as % of Total Expenditures (2) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Social Services (b) | | Defense | | | | Health | |
| | | 1980 | 1995 | 1980 | 1995 | 1981-90 | 1991-95 | 1981-90 | 1991-95 |
| Austria | 2 1 | 78.8 | 77.8 | 3 | 3.7 | 2.9 | 2.3 | 12 4 | 13.3 |
| Germany | 1.4 | 74.9 | | 9.1 | | 8.8 | 6.4 | 18.6 | 16.8 |
| Hungary | 0 7 | 31 | | 4.4 | | 4.5 | | 3 4 | |
| Czech Republic | | | 65.7 | | 5.7 | | 6.1 | | 17.2 |
| Slovak Republic | | | | | | | | | |
| Slovenia | | | | | | | | | |
| Croatia | | | 60.9 | | 21.1 | | 18 7 | | 15.3 |
| Bosnia-Herzegovinia | | | | | | | | | |
| Former Yugoslovia | | | | | | | | | |
| Albania | | | 40.2 | | 7.1 | | 7.1 | | 5.6 |
| Bulgaria | | | 35 | | 6 3 | | 7 | 1.7 | 3 2 |
| Romania | | 28.3 | 54.8 | 3.8 | 6.2 | | | 3.1 | 8.1 |
| Ukraine | | | | | | | | | |
| Poland | 1.1 | | | | | | | | |
| Moldova | | | | | | | | | |
| Switzerland | | 69 | 75.2 | 10.2 | 15.2 | | 7.1 | 13 | 20.7 |
| Italy | | 55.3 | | 3 4 | | | | 11 | |

Notes a PAC expenditure for mid-1990s or latest available year

b Social services includes eductation, health, social security, welfare, housing and community

Sources (1) Towards Sustainable Development - Environmental Indicators, 1998, OECD Publications, copyright OECD 1998, adapted by permission of the Organization for Economic Co-operation and Development (OECD)
(2) World Development Report 1997- The State in a Changing World, 1997, copyright 1997 by the International Bank for Reconstruction and Development/The World Bank, reproduced by permission of Oxford University Press, Inc

## Table 5.4: 1995 Commercial Energy Production and Consumption

| Country | Pollution Abatement and Control Expenditure as % GDP (a)(1) | Central Government Budget as % of Total Expenditures (2) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Social Services (b) | | Defense | | | | Health | |
| | | 1980 | 1995 | 1980 | 1995 | 1981-90 | 1991-95 | 1981-90 | 1991-95 |
| Austria | 2 1 | 78 8 | 77.8 | 3 | 3 7 | 2 9 | 2.3 | 12 4 | 13.3 |
| Germany | 1.4 | 74.9 | | 9.1 | | 8.8 | 6.4 | 18.6 | 16.8 |
| Hungary | 0 7 | 31 | | 4 4 | | 4.5 | | 3 4 | |
| Czech Republic | | | 65.7 | | 5.7 | | 6.1 | | 17.2 |
| Slovak Republic | | | | | | | | | |
| Slovenia | | | | | | | | | |
| Croatia | | | 60.9 | | 21.1 | | 18.7 | | 15.3 |
| Bosnia-Herzegovinia | | | | | | | | | |
| Former Yugoslovia | | | | | | | | | |
| Albania | | | 40.2 | | 7.1 | | 7.1 | | 5.6 |
| Bulgaria | | | 35 | | 6.3 | | 7 | 1 7 | 3 2 |
| Romania | | 28.3 | 54.8 | 3.8 | 6.2 | | | 3.1 | 8.1 |
| Ukraine | | | | | | | | | |
| Poland | 1.1 | | | | | | | | |
| Moldova | | | | | | | | | |
| Switzerland | | 69 | 75.2 | 10.2 | 15.2 | | 7.1 | 13 | 20.7 |
| Italy | | 55.3 | | 3 4 | | | | 11 | |

Notes (taken from WRI, 1998 directly)

a Solid fuels include bituminous coal, lignite, peat, and oil shale burned directly

b Primary electricity generated by noncombustible energy sources (incorporates efficiencies) · nuclear, wind, tidal, wave, solar, geothermal, hydroelectric

c Commercial energy production includes total energy production, solid, liquid, and gaseous fuels, and primary electricity production

d Commercial energy is domestic production plus net imports minus stock increases, and minus aircraft and marine bunkers

e Traditional fuels include fuel wood, charcoal, bagasse , and animal and vegetable wastes

f Energy dependence is calculated as being equal to (total consumption - total production)/(total consumption), shown as a percentage

Source World Resources 1998-1999 - A Guide to the Global Environment, 1998, Oxford University Press, copyright 1998 WRI, data tables adapted by permission of World Resources Institute (WRI)

CEE countries have made substantial progress during what has been viewed as the initial phase of economic transition, which has focused on "liberalization, privatization, and macroeconomic stability" (EBRD, 1997). Major challenges remain, viewed as the second phase of economic transition, which will force nations to build, consolidate, and strengthen the institutions that underlie a market based economy, to include better governance, openness, transparency, credibility, and less corruption (EBRD, 1997). There has been significant restructuring of the various economic sectors. Generally, industry has been contracting, while the service and agriculture sectors have been expanding.

The European Bank for Reconstruction and Development 1997 Transition Report (EBRD, 1997) evaluated regional economic performance. Countries undergoing economic transition were placed into two groups based on progress to date. The first group comprise countries at advanced stages of transition and included the following Danube River Basin nations: the Czech Republic, Hungary, Poland, the Slovak Republic, and Slovenia. The second group, countries at less advanced stages of transition, include Bulgaria, Albania, Bosnia-Herzegovina, and Romania. Croatia is considered on the borderline of the two groups. Table 5.2 (Page 59) summarizes macroeconomic indicators for these transition countries.

Growth in real gross domestic product (GDP) continues to make progress, but more slowly than in previous years. Cumulative growth in real GDP in 1996, using 1989 as the baseline, shows considerable progress, especially in Poland, where the estimated real GDP for 1996 exceeds the level in 1989. Conversely, progress has been very slow in the Ukraine, which is surprising given the country's mineral wealth, and the relatively strong industrial and agricultural base at the time when it broke with the Soviet Union (Butts, 1993b). The real level of GDP growth for the Ukraine in 1996 was only 39 percent of 1989 levels (Table 5.2).

Privatization remains an important step in altering the pre-1989 relationship between government and enterprises, but it must be followed by changes in ownership and corporate governance. The private sector share in GDP, as shown in Table 5.2, continues to grow rapidly and for many countries is already at levels comparative to those in Western Europe.

Inflation and unemployment appear to have been brought under control in most transition countries. In Bulgaria, however, because of the loss of macroeconomic control during 1996 and 1997, inflation rates of 311 and 600 percent are being estimated for those years, respectively (EBRD, 1997).

There has also been a continued deterioration of current account balances and a growing trade deficit for most transition economies. This, and a rapid build-up of foreign debt, could contribute to currency volatility and potential balance-of-payments crises (EBRD, 1997). Table 5.2 also provides an estimate of the "unofficial economy" as a percentage of total GDP. These percentages are the highest for the Ukraine and Bulgaria, reflective of poor progress in the official economy, as measured the estimated real GDP for 1996 as compared to 1989. Since a substantial portion of economic activity remains undeclared or underdeclared, caution should be used in making comparisons between nations.

Criteria for accession to the EU include a large number of detailed and demanding obligations to ensure members have a well functioning and market-based competitive economy with accompanying democratic institutions (EBRD, 1997). The goal of a single European market, enshrined in the Treaty of Rome, became the basis for the EU constitution in 1958 which listed as four basic freedoms, the movement of goods, services, capital, and people (EU, 1996a). The EU has made great strides in meeting these goals. In 1993, for example, checks at member state internal borders were ended.

Many CEE and former Soviet Union (FSU) nations are not yet applicants for EU membership. Several are unlikely candidates, given the difficult task of accelerating the needed transformation of the financial sector to allow for increasing competition on an international level, the costs associated with the integration required of both transport and communication infrastructure, and compliance with a myriad of EU health, safety, and environmental directives (Borish et. al, 1996, EBRD, 1977).

Decades under central and authoritarian planned economies has caused environmental degradation that will take time and monies to address. While CEE countries generally had environmental laws and regulation on the book that were compatible with much of Western Europe's, they were not typically enforced in the past. Earlier economic dependency on heavy industry and inefficient and high intensity sources of energies have resulted in a legacy of high air, land, and water pollution. A summary of environmental, social services, defense, and health for the Danubian nations is provided at Table 5.3 (Page 59). Consistent information is lacking for many of the CEE countries, making comparisons and trend analysis difficult.

The transition economies are also contributing to different consumption patterns more typical of Western values. Associated with a growth for Western goods are social and environmental trends that many would view as negative (REC, 1994). One example is the increased demand for automobiles, which is quickly exceeding the capacity of existing roads and infrastructure. This growth in automobile usage comes at a cost of increased air emissions and acidification, less reliance on environmentally friendly public transport, and passing on increased operating costs for public transport to those already financially burdened. Environmental policy addressing increased nitrogen oxide emissions from the transport sector has not kept up with the corresponding growth in transport use (EEA, 1998).

The majority of EU environmental legislation is in the form of directives dependent on the implementation and enforcement of national laws by the respective member states. National laws typically are based on the "polluter pays" principle. The estimated cost for the ten nations aspiring EU membership to adapt applicable EU environmental standards exceeds ECU 100 billion (EBRD, 1997). This includes investment costs for upgrades to pollution control systems. Reportedly the European Commission has committed to providing half this amount in aid (Pirages, 1997).

In a recent study of five CEE countries, notable improvements in water quality were observed in the ongoing transition period involving macroeconomic reforms and structural changes to financial systems (Scheierling, 1996). Specifically, organic pollution (measured by biochemical oxygen demand) and nutrients have been reduced in several tributaries to the Danube. Data on heavy metals, pathogens, and other pollutants was not readily available. The study attributed this, in large part, to the withdrawal of governments from price setting and support for intensive livestock operations. Higher costs for water supply and sewage treatment have created incentives leading to decreased water consumption and less intensive agricultural practices.

Further structural reforms are needed to meet the more stringent EU air and water environmental standards (EBRD, 1997). As a result, it is unlikely that many CEE countries will be able to achieve them in the short- or medium-term. Consequently, many CEE countries are pursuing a river basin approach, employing ambient water quality standards versus effluent standards (Scheierling, 1996).

The EU has a strong record of environmental legislation spanning some 30 years. However, a lack of appropriate institutions, staff, resourcing, and compliance monitoring by many existing EU member states has led to an increasing number of complaints to the European Commission. Measures are being contemplated to require member states to adopt penalties for violation of national laws which implement EU law and for failure to comply with decisions of the Court of Justice, the EU's "Supreme Court" (EU, 1997a).

## Table 5.5: 1995 Electricity Production (million kilowatt-hours)

| Country | Thermal (a) | Hydroelectric | Geothermal | Nuclear | Total (b) | Thermal as % Total Production | Hydroelectric as % Total Production |
|---|---|---|---|---|---|---|---|
| Austria | 18,110 | 38,477 | | | 56,587 | 32% | 68% |
| Germany | 356,224 | 24,217 | 370 | 154,091 | ##### | 67% | 5% |
| Hungary | 19,827 | 164 | | 14,026 | 34,017 | 58% | 0% |
| Czech Republic | 45,494 | 1,726 | | 13,627 | 60,847 | 75% | 3% |
| Slovak Republic | 8,100 | 4,640 | | 12,500 | 25,240 | 32% | 18% |
| Slovenia | 4,629 | 3,240 | | 4,779 | 12,648 | 37% | 26% |
| Croatia | 7,137 | 1,726 | | | 8,863 | 81% | 19% |
| Bosnia-Herzegovinia | 783 | 1,420 | | | 2,203 | 36% | 64% |
| Former Yugoslovia (b) | 7,550 | 11,220 | | | 37,176 | 20% | 30% |
| Albania | 210 | 4,204 | | | 4,414 | 5% | 95% |
| Bulgaria | 19,263 | 5,265 | | 17,261 | 41,789 | 46% | 13% |
| Romania | 42,573 | 16,693 | | | 59,266 | 72% | 28% |
| Ukraine | 128,270 | 12,430 | | 53,300 | ##### | 66% | 6% |
| Poland | 135,141 | 3,851 | 14 | | ##### | 97% | 3% |
| Moldova | 8,112 | 280 | | | 8,392 | 97% | 3% |
| Switzerland | 2,225 | 35,954 | 6 | 24,895 | 63,080 | 4% | 57% |
| Italy | 195,754 | 41,907 | 3,450 | | ##### | 81% | 17% |

Notes a Electricity generated from the heat produced by the burning of fossil and renewable fuels
b Total reflects value provided in source document - not calculated
Source World Resources 1998-1999 - A Guide to the Global Environment, 1998, Oxford University Press, copyright 1998 WRI, data tables adapted by permission of World Resources Institute (WRI)

## Table 5.6: 1990 Energy Reserves and Resources

| Country | Anthracite and Bituminous Coals (million metric tons) | | Subbituminous & Lignite Coals (million metic tons) | | Crude Oil (million metric tons) | Natural Gas (billion cubic meters) | Hydroelectic (megawatts) | |
|---|---|---|---|---|---|---|---|---|
| | Proved Reserves in Place | Proved Recoverable Reserves | Proved Reserves in Place | Proved Recoverable Reserves | Proved Recoverable Reserves | Proved Recoverable Reserves | Known Exploitable Potential | Installed Capacity |
| Austria | | | 350 | 59 | 15 | 19 | 56,800 | 10,923 |
| Germany | 44,000 | 23,919 | 102,000 | 56,150 | 62 | 347 | 27,000 | 8,944 |
| Hungary | 1,407 | 596 | 8,305 | 3,865 | 22 | 104 | 4,500 | 48 |
| Czech Republic (a) | 5,400 | 1,870 | 6,100 | 3,500 | 2 | 14 | 10,826 | 2,940 |
| Slovak Republic (a) | ↑ | ↑ | ↑ | ↑ | ↑ | ↑ | ↑ | ↑ |
| Slovenia (b) | 80 | 70 | 17,760 | 16,500 | 32 | 82 | 71 | 7,000 |
| Croatia (b) | ↑ | ↑ | ↑ | ↑ | ↑ | ↑ | ↑ | ↑ |
| Bos.-Herzegovinia (b) | ↑ | ↑ | ↑ | ↑ | ↑ | ↑ | ↑ | ↑ |
| Form. Yugoslovia (b) | ↑ | ↑ | ↑ | ↑ | ↑ | ↑ | ↑ | ↑ |
| Albania | | | 15 | | 24 | 20 | 17,000 | 690 |
| Bulgaria | 36 | 30 | 4,418 | 3,700 | 2 | 7 | 2,240 | 1,975 |
| Romania | 1 | 1 | 3,199 | 3,117 | 157 | 150 | 40,000 | 5,583 |
| Ukraine | | | | | | | | |
| Poland | 65,800 | 29,600 | 12,900 | 11,600 | 2 | 166 | 12,000 | 1,851 |
| Moldova | | | | | | | | |
| Switzerland | | | | | | | 5,600 | 4,171 |
| Italy | | | | | 66 | 282 | 65,000 | 18,700 |
| Russian Federation | | | | | 5132 | 40692 | | |

Notes Included in value of country above a The former Czechoslovakia b Yugoslalvia prior to dissolution of nation states
Source World Resources 1994-1995 - A Guide to the Global Environment, 1994, Oxford University Press, copyright 1994 WRI, data tables adapted by permission of World Resources Institute (WRI)

## Table 5.7: 1998 Soviet Designed Nuclear Power Plants - Danube River

| Countries | Location | Reactor Number | Reactor Type (1) | Net Output (MegaWatts) (1)(2) | Commercial Start (1)(2) |
|---|---|---|---|---|---|
| **Hungary** | Paks | 1 | VVER-440/213 | 440 | 1982 |
| | | 2 | VVER-440/213 | 450 | 1884 |
| | | 3-4 | VVER-440/213 | 460 | 1986/87 |
| **Czech Republic** | Dukovany | 1-4 | VVER-440/213 | 440 | 1985/86/86/87 |
| | Temelin | 1-2 | VVER-1000 | 910 | under construction |
| **Slovak Republic** | Bohunice | 1-2 | VVER-440/230 | 430 | 1978/80 |
| | Bohunice | 3-4 | VVER-440/213 | 430 | 1984/85 |
| | Mochovce | 1 | VVER-440/213 | 440 | 1998 |
| | Mochovce | 2-4 | VVER-440/213 | 440 | under construction |
| **Bulgaria** | Kozluduy | 1-4 | VVER-440/230 | 400 | 1974/75/81/82 |
| | Kozluduy | 5-6 | VVER-1000 | 910 | 1988/93 |

Sources
(1) Extrabudgetary Programme on the Safety of WWER and RBMK Nuclear Power Plants, International Atomic Energy Agency (IAEA), obtained from IAEA Web Page - 27 August 98
(2) The Danube For Whom and For What? - Final Report to European Bank for Reconstruction and Development, Equipe Cousteau, 1993, adapted by permission from Equipe Cousteau/The Cousteau Society

# Table 5.8: Renewable Water Resources

| Country | 1998 Annual Internal Renewable Water Resources (b) | | Annual Withdrawals (c) | | | | | | | Groundwater | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Withdrawals Facts | | | | Sectoral Withdrawals (Percentage) | | | Groundwater facts | | | | Sector Groundwater Withdrawals (Percentage) | | |
| | Total (km3) | Per Capita (km3) | Year Date | Total (km3) | Percentage of water Resources | Per Capita (km3) | Dom | Indust (d) | Agri | 1998 Average Annual Recharge (e)(f) km3 | Yr | Annual Withdrawal for Year Shown (km3) | % of Recharge | Dom | Indust | Agri |
| Austria | 56.30 | 6,857 | 91 | 2.36 | 4 | 304 | 33 | 58 | 9 | 22.3 | 90 | 1 | 5.0 | 52.1 | 42.7 | 5.1 |
| Germany | 96.00 | 1.165 | 91 | 46.27 | 48 | 580 | 11 | 70 | 20 | 45.7 | 90 | 8 | 16.9 | 48.6 | 47.5 | 3.9 |
| Hungary | 6.00 | 604 | 91 | 6.81 | 114 | 660 | 9 | 55 | 36 | 6.8 | 90 | 1 | 15.1 | 35.0 | 47.6 | 17.5 |
| Czech Republic | 58.21 | 5.694 | 91 | 2.74 | 5 | 266 | 41 | 57 | 2 | | 90 | 1 | | | | |
| Slovak Republic | 30.79 | 5.745 | 91 | 1.78 | 6 | 337 | | | | | 90 | 1 | | | | |
| Slovenia | | | | | | | | | | | | | | | | |
| Croatia | 61.40 | 13.663 | | | | | | | | | | | | | | |
| Bos -Herzegovinia | | | | | | | | | | | | | | | | |
| Form, Yugoslovia | | | | | | | | | | | | | | | | |
| Albania | 44.50 | 2.903 | 90 | 0.20 | 2 | 94 | 6 | 18 | 76 | 7.0 | | | | | | |
| Bulgaria | 18.00 | 2.146 | 88 | 13.90 | 77 | 1.574 | 3 | 76 | 22 | 13.4 | 88 | 5 | 37.3 | | | |
| Romania | 37.00 | 1.639 | 94 | 26.00 | 70 | 1.139 | 8 | 33 | 59 | 8.3 | 75 | 1 | 14.2 | 61.0 | 38.1 | 0.8 |
| Ukraine | 53.10 | 1.029 | 92 | 25.99 | 49 | 504 | 18 | 52 | 30 | 20.0 | 85 | 4 | 21.1 | 30.3 | 17.5 | 52.1 |
| Poland | 49.40 | 1.278 | 91 | 12.28 | 25 | 321 | 13 | 76 | 11 | 36.0 | 90 | 2 | 6.7 | 70.0 | 30.0 | |
| Moldova | 1.00 | 225 | 92 | 2.96 | 296 | 667 | 9 | 65 | 26 | 0.4 | | | | | | |
| Switzerland | 42.50 | 5.802 | 91 | 1.19 | 3 | 173 | 23 | 73 | 4 | 2.7 | 90 | 1 | 35.1 | 94.7 | 5.3 | |
| Italy | 159.40 | 2,785 | 90 | 56.20 | 35 | 986 | 14 | 27 | 59 | 30.0 | 85 | 12 | 40.0 | 53.1 | 13.3 | 33.7 |

Notes (taken from WRI, 1998 directly)

a Data is provided for specified years shown in the table b The average annual flow of rivers and recharge of groundwater generated from endogenous precipitation c The total water withdrawals, not counting evaporative losses from storage basins, as a percentage of internal renewable water resources d Some countries include water withdrawn to cool thermoelectric plants, which can be a significant amount of total water withdrawal e The amount of water that annually infiltrate soils, including water from rivers and streams f In general, this figure would represent the maximum amount of water that could be withdrawn annually without ultimately depleting the groundwater resource

Source World Resources 1998-1999 - A Guide to the Global Environment, 1998, Oxford University Press, copyright 1998 WRI, data tables adapted by permission of World Resources Institute (WRI)

Foreign direct investments have continued to flow into transition countries at a rapid pace (Table 5.2) and the outlook is positive, especially for Poland (EBRD, 1997). Continued foreign investment is contingent on the perception of environmental risk, increasingly weighted with that of economic and political risk. One study queried over a thousand of the largest corporations involved in mining, construction, and manufacturing in North America and Western Europe as to their investment decisions in the CEE region (Klavens and Zamparutti, 1995). The study found that foreign companies are increasingly concerned with past and future environmental liabilities, and thus more willing to perform environmental assessments of potential plant sites at the time of investment. Understandably, companies also want indemnification for potential environmental liabilities.

## 5.3 Energy Dependencies and Efficiencies

Among the most complex problems facing the CEE transition economies is energy reform, which plays a critical role in daily life. Environmental deterioration is closely linked and, thus, cannot be dissociated from energy production and use. Inefficiencies in energy management continue to plague the CEE region. Many CEE countries remain heavily dependent upon pollution-causing solid fuels, while Western Europe has successfully transitioned to a balance among various sources of energy. While the transition from coal to petroleum and natural gas has helped to clean up the environment in many Western European nations, it has also increased dependency on an uninterrupted flow of imports.

A summary of total energy production by fuel type, and total energy consumption for each of the Danubian countries, is provided at Table 5.4 (Page 60). Electric production by source of energy is summarized at Table 5.5 (Page 63). Known reserves of solid and liquid fuels, natural gas, and hydroelectric potential are listed at Table 5.6 (Page 63). CEE countries continue to exploit known reserves of energy sources. The Czech Republic, Poland, and Germany have vast quantities of coal reserves, which provide a significant share of their total energy consumption, and serve as a major source for electrical production. Germany, Austria, and Romania have considerable unexploited hydroelectric potential. Romania's major source of energy is based upon an abundant reserve of natural gas.

Comparative energy dependence is provided at Table 5.4. As a result of their vast coal reserves, Poland and the Czech Republic are among the least dependent on imported energy. Poland, in fact, is a major exporter of coal (Pirages, 1997). Austria remains heavily dependent on hydroelectric power, having few other natural energy resources. This dependency led Austria to support the completion of the controversial Nagymaros portion of a major dam on the Danube, discussed as Case Study 2 at the end of this chapter. Four nations within the Danube River Basin (e.g., Bulgaria, Hungary, Czech Republic, and Slovakia) have built nuclear power plants to provide a considerable portion of primary electricity production.

The attractiveness of hydroelectric and nuclear power within the region, however, must be balanced against the potential impact on the environment and human health. Hydraulic impoundments are known to concentrate pollutants above groundwater systems and change adjacent water tables, adversely impacting both drinking water sources and sensitive ecosystems. The Equipe Cousteau study recommended that development of hydroelectric power be limited and moderate (EBRD, 1993).

This same study suggested that nuclear energy is not only unsafe, but more importantly unnecessary (EBRD, 1993). It was recommended that more attention be directed at improving efficiencies and exploiting renewable energies. These sources include small hydroelectric power systems of less than ten megawatts,

solar heating, and energies from wood, and urban/rural waste. It was estimated that renewable energy could provide a minimum of 12 percent of total primary energy consumption. Each of these alternatives, however, has an environmental impact that must also be considered.

In 1998, there were 58 operational Soviet-designed nuclear power reactors in the CEE countries, Lithuania, Ukraine, Finland, and Russia with several more under construction (International Atomic Energy Agency (IAEA), 1998). Within the Danube River Basin alone, there were 19 operating reactors, with another five under construction. The locations and reactor types for those in the Danube River Basin are listed in Table 5.7 (Page 64). Bulgaria's six reactors at its Kozluduy's nuclear power plant on the Danube River are a major source of environmental debate with Romania and the former Yugoslavia. The 1998 opening of a Soviet-designed reactor at the Mochovce nuclear power plant in Slovakia resulted in public protests and the recall of the Austrian Ambassador. This is discussed in more detail at Case Study 1 at the end of this chapter.

All 19 reactors in the Danube Basin are of the pressurized-water (VVER) type and not Chernobyl (RBMK) channel type (IAEA, 1998). A feature of the VVER reactors is that they also generate greater amounts of radioactive wastes compared with other types, because of under-designed waste management systems (IAEA, 1995).

Recent studies report these Soviet-designed reactors to have been poorly constructed and to be suffering from a broad range of safety deficiencies (EBRD, 1996a; IAEA, 1998; and Tarics and Kuntz, 1998). Researchers point to the fact that these reactors have been operated by personnel with questionable morale (Pirages, 1997) and in a working environment lacking of a proper safety culture (EBRD, 1996a). Reportedly, these reactors have serious electrical problems with poor backup systems, deteriorating steel in the reactors vessels, and with reactor containment often only consisting of a steel dome (EBRD, 1993).

There are also concerns over the seismic activity of the sites themselves. Reportedly, many of the original assumptions used in designing the nuclear power plant facilities to withstand the horizontal forces of a likely earthquake are believed to have been grossly underestimated (Tarics and Kuntz, 1998).

One estimate to decommission 33 of the most dangerous nuclear reactors in the CEE region and bring the others up to Western safety standards is staggering, over $10 billion (EBRD, 1993). Another report estimates the cost to be as high as $20 billion (Gray, 1995). The long-term storage of highly radioactive wastes and decommissioned reactors is also a serious and costly issue facing the region, given the lack of large tracts of uninhabited lands needed for such sites. Western European experience concerning decommissioning indicates that dismantling may be less costly than once thought (NEA, 1997).

The efficient use of energy is also closely linked with economic development. Energy intensities are provided in Table 5.4. Total energy consumed per unit of GDP is considerably higher for the CEE countries compared to the western Danubian countries. Poland and the Czech Republic have high energy intensities, even though they are the least dependent among the CEE countries on imported energy sources. Austria, on the other hand, has the lowest energy intensity, while being the most dependent on imported energy.

The high level of energy intensities for a majority of the Danubian nations is reflective of past economies based primarily on heavy industries, inefficient electrical production and distribution systems, and an aging and poorly maintained industrial and domestic energy infrastructure (EBRD, 1993, and Clark, 1995). A revamping of regional energy policies is suggested that promotes increased energy efficiencies, incentive systems, and improvements to the supporting infrastructure.

The breakup of the integrated energy supply systems supporting the former Soviet Union has resulted in higher energy prices in CEE for oil and coal, more reflective of international levels. CEE governments have continued to subsidize pricing for those transmission and distribution systems providing electricity, gas, and heat to residential consumers, which are by their nature, natural monopolies. Many countries considering whether to continue state ownership of utilities or to privatize are often motivated by other macroeconomic and social factors, that do not necessarily encourage efficient energy reform (Clark, 1995).

Russia, with it's vast reserves of crude oil and natural gas (Table 5.6), remains a dominant supplier of energy to Europe and efforts are continuing to reintegrate parts of the old supply system. Russian exports of natural gas through the Ukraine, Slovakia, and the Czech Republic will continue to be an important source of hard currency for these countries. Russian oil production has been declining for a decade and investment is needed to upgrade refineries capable of producing gasoline and diesel, in lieu of heavier fuel oils. An expansion of Russian gas exports is believed extremely profitable, given greater EU liberalization in energy trade (Clark, 1995).

The European continent is dependent on two major pipeline networks for petroleum and natural gas. One originates in the North Sea and the other from Siberia. Middle Eastern tankers also provide significant amounts of petroleum. Rich reserves of natural gas and oil have been found in the Caspian Sea and in several former Soviet Union countries (Azerbaijan, Kaszakhstan, Turkmenistan, and Uzbekistan).

Decisions are being made concerning where to put new pipeline networks and potential maritime supply routes. Understandably, Russia would prefer pipelines from the former Soviet Union countries routed through their territory to the Black Sea, which would guarantee significant transit fees. Turkey favors northern routes to ports on the Mediterranean, but these routes are subject to possible Kurdish attack (Pirages, 1997). Moldova has also held discussions with Georgia, Ukraine, and Azerbaijan over a Caspian Sea oil pipeline (Muller, 1998). The controversy surrounding the Moldovan oil-importing terminal on the Danube is examined in more detail in Case Study 3 at the end of this chapter.

Countries in the region will pursue reforms that support energy self-sufficiency. There is considerable long-term benefit to their respective economies and the environment if these programs focus on less pollution-causing sources of energy and increased efficiencies in production and distribution systems. If, as expected, the CEE economies transition to less energy intensive industries, additional demand and capacity may also be forestalled. Several countries, however, may opt to continue use of nuclear energy, even with all of the associated safety and long-term waste management issues, because it may be less expensive in the short-term than the alternative of purchasing imported energies. The expansion of nuclear capabilities has important security implications to Europe and to the United States.

## 5.4 Water Availability

The Danube River comprises a complex hydrological system due to the varied nature of its tributaries as a result of the construction of numerous hydraulic structures for water supply, navigation, flood control, and power production along much of inland water network since the mid-eighteenth century (EBRD, 1993 and EPDRB, 1995). These regulation works have altered the natural alluvial floodplain system, especially in Germany and Austria following World War II.

At the mouth of its delta, the mean flow of the Danube averages 6,857 cubic meters per second (Haskoning, 1994). Discharge varies widely between low and peak flows, 1,610 to 15,540 cubic meters per

second, respectively (EPDRB, 1995). Seasonal patterns in mean monthly discharge at several stations are provided in Appendix D. The large seasonal variations often result in water shortages on several tributaries, especially in the summer and middle of the winter. The contribution of flow from the various tributaries is provided in Appendix E.

Total freshwater resources and withdrawals for the Danubian countries are summarized in Table 5.8 (Page 65). Water resource data was not readily available for several nations, especially those that comprised Yugoslavia prior to its dissolution. Researchers recommend caution in making comparisons between countries because of the varied nature of the data, given varying sources and dates of recorded information (WRI, 1998 and Haskoning, 1994).

Competition for water is particularly serious on the left bank tributaries in Hungary, and the tributaries in Romania and Bulgaria (EPDRB, 1995, Gleick, 1993). This dependency can be seen in Table 5.8 by comparing annual withdrawals as a percentage of internal renewable water resources for each of these countries. Conversely, the nations of the former Yugoslavia and Austria have significant water resources. The percent of total water usage by domestic, industrial, and agricultural sector is also shown in Table 5.8.

Irrigation in support of agriculture is one the largest competitors for water (EPDRB, 1995), especially in Romania. Many irrigation systems, however, are currently oversized and have not been properly maintained, leading to widespread waste. Similar practices can be found in the industrial sector, where low to nonexistent water tariffs have not encouraged conservation. A significant percentage of water resources are used to support industrial enterprises in the region (Table 5.8).

The current strategic plan on the Danube suggests that the main stem of the river can support the current demand for drinking water (EPDRB, 1995). However, it may not be able to meet the needed capacity to maintain navigation in some portions of tributaries, nor allow for diversions to support additional hydroelectric power production.

## 5.5 Waterways as Economic Arteries

The Danube is one of the world's longest and busiest rivers, becoming navigable at the German city of Ulm. With over 30 of its tributaries also navigable (Ridgeway, 1992), it has long been crucial to the culture and economy of Central Europe, linking four national capitals: Vienna, Bratislava, Budapest, and Belgrade. It is the only important European river that flows from west to east (WWFN, 1998). The Danube is also the only river in the world, by international agreement, that guarantees free right of passage without permission or tariffs (Jakobi, 1996).

The Main-Danube Canal, a massive and controversial project, was completed in 1992. King Ludwig I of Bavaria completed a much smaller and narrower version of the canal in 1845, which operated for over a century. First conceived by Emperor Charlemagne in the eighth century, this 171 kilometer trans-European waterway now links the North Sea with the Black Sea (Figure 4.6, Page 52). This modern canal is 55 meters wide and 4 meters deep and connects over 15 European countries (Land, 1992b), providing access to over 4,300 kilometers of inland waterways (Bryson, 1992). The construction of the canal also allows for spread of fauna between the different riverine systems (Tittizer, 1996).

Construction on the Main-Danube Canal began in 1921, with most of the work done during the last 30 years. The project was self-financing with profits from some 55 hydroelectric power stations. Charges for the

costs of transport will also be levied on the beneficiaries (Nature, 1992). It is estimated the canal will be paid off by 2050. The modern canal can accommodate the large Euro-barges, capable of carrying the equivalent of 78 truck trailers of cargo. Although, not entirely practical, ships can now sail the 3,500 kilometers from Rotterdam to the Black Sea.

An earlier canal was also constructed between Cernavoda and Constanza, Romania in 1984. This 64-kilometer canal shortened the route from the Danube to the Black Sea by some 370-kilometers. Reportedly over 100,000 workers, primarily prisoners or political detainees, lost their lives as a result of overexposure, malnourishment, and accidents from 1949 to 1953 (Kaplan, 1996). CEE markets are hopeful these manmade waterways may prove to be lucrative conduits to their emerging economies (Bryson, 1992). Other countries such as Kazakhstan and Georgia are also using the Danube in lieu of rail for easier access to Western markets (Jakobi, 1996).

Originally established by the Treaty of Paris in 1856, the Danube Commission remains the oldest intergovernmental organization in the basin, its primary task to regulate river transport. The Commission includes eight member countries (e.g., Austria, Slovakia, Hungary, Yugoslavia, Romania, Bulgaria, Ukraine, and Russia) and three observer countries (Germany, Croatia, and Moldova) applying for full membership. The former Soviet Union had been a central focus of the Commission, and Russia has remained a member.

Commission regulations have historically addressed river sanitation only as concerns forbidding the disposal of trash overboard or the pumping out of bilge and sewage from riverboats and barges. Having no river police, its power is limited, relying heavily upon signatory nations to enforce its rules (Rich, 1991). More recently, the Commission has focused attention on regulations for hazardous material transport that would be consistent with other major rivers (e.g., the Rhine) and on harbor modernization.

Transporting bulk goods by water is considered cheaper, cleaner, and more energy efficient. In 1987, prior to the Balkan War, the river transported 100 million metric-tons of goods, eight times that in 1950 (Jakobi, 1996). Even with the lifting of sanctions and transport restrictions, the capacity of the Danube River transport system remains underutilized, with only 30 million metric-tons currently being transported annually (Westing, 1989b, Jakobi, 1996).

The potential economic importance of the Danube and its tributaries is apparent when considering that the cost of moving a ton of goods one kilometer by water is considerably cheaper than by rail or by road. Bryson (1992) estimated the costs at $0.03, $0.09 , and $0.19 respectively. In order to promote further development of the Danube for inland shipping, Austria recently hosted a regional business conference in May 1998, entitled "The Danube Region."

Proponents for increased water transport also point to the associated environmental and social advantages that make it attractive. There is generally little noise, reduced fuel consumption in moving goods, and reduced pollution associated with river transport. The director-general of the Danube Commission reported that river transport accounts for only two percent of Danube pollution, the majority coming from cities and industries within the watershed (Jakobi, 1996). The river also has significant potential for increased recreation and tourism. Austria and Hungary are both planning to invest in additional recreational-based marinas.

There are a total of 20 dams and 28 hydroelectric power plants sited on the mainstem of the Danube River in Germany and Austria (Haskoning 1994, EBRD 1993). With the exception of the Iron Gate I and II

hydroelectric power plants in the lower reach, the Danube is relatively undeveloped downstream of Vienna. The Nagymaros section of the river, north of Budapest, is one of the only parts along the main stem where frequent navigation problems (e.g., "bottlenecks") occur during several months as a result of icing and low flows (EBRD, 1993).

The Danube Commission has recommended the construction of an additional series of eleven dams to ensure a minimum depth of 2.5 meters along the Nagymaros section of the river in Hungary so that deep draft barges may navigate the river throughout the year. Other research suggests a more economic and less environmentally damaging approach, comprising a series of four dams and locks near Vienna, Hainburg, Wolstahl, and Nagymaros. The cost, excluding the Gabcikovo complex and hydroelectric installations, is believed close to $1 billion (EBRD, 1993). The report estimates that return on investment to be only between 25 and 50 percent of net earning through the year 2020. The benefits versus costs for improvements to the Vienna-Budapest reach of the Danube remain controversial.

Studies of country-to-country traffic suggest that water transport is important to local navigation, especially in the lower reaches, where there is a large traffic in crude minerals, sand and gravel. Internally, Romania transports considerable goods along the Danube. One of the main beneficiaries to the navigation improvements is the iron and steel industry in the region dependent on the importing of ore from the Ukraine and southern hemisphere. The opening of the Rhine-Main-Danube canal, coupled with improvements to the Nagymaros bottleneck, would provide Austria's important iron and steel industry, centered around Linz, two competitive transport routes and may be critical to its future survival (EBRD, 1993).

Future projections suggest that development will be towards the Black Sea and country-to-country traffic will remain localized. It is also unlikely that future development will induce transfer from road networks to the Danube inland waterway system (EBRD, 1993). The Danube Commission is optimistic, however, and has recommended a program of harbor modernization. Only half of the existing harbors along the Danube fulfill the basic requirements for linking with rail and road systems (SECI, 1997b). Harbors are also spaced at an average of every 75 kilometers, compared to a spacing of 25 kilometers on the Rhine. Additional harbors are hoped to act as crossroads and promote "centers of development" and force "standardization" in the technical specifications of ships, to include environmental controls (Jakobi, 1996).

An impetus for much of proposed navigation improvements following World War II until the recent demise of the former Soviet Union is believed in direct support to regional security. The Danube could have provided another avenue for the movement of large flotillas of Warsaw Pact forces in an invasion of Western Europe, as history has shown (Lipschutz, 1997). It is vital to recall the importance that the Soviet Union had placed on the region, exerting considerable control over the Danube Commission for decades. It should also be recalled that Russia, although no longer a Danubian nation, maintains its seat on the Commission.

The United States Army, in support of NATO's operations in the Balkans has utilized the Danube inland waterway system in redeploying military equipment from Baja, Hungary to Rotterdam, a trip of 12 days sail time (George, 1996). This mode of transport has many reported advantages. A typical barge can hold the equivalent of 25 rail cars. Loading of barges is reportedly significantly simpler and safer, requiring only half of as many soldiers to load and perform the required blocking or bracing of equipment required of railcars. Barge transport requires only one customs clearance, compared to checks at each border using land systems. Barge transport, while subject to longer transit time, malfunctions of locks, and low river levels and icing, provides an economic means of transport to complement road, rail, and air systems.

## 5.6 Ethnic Conflict and Ecoterrorism

The four-year Balkan war left more than 200,000 people dead (Csagoly, 1997). The Balkans, meaning "mountains" in Turkish, can be viewed as a "confused, often violent ethnic caldron," tied only by a common Serbo-Croatian language (Kaplan, 1994). The ethnic diversity is a result of earlier described imperial influences and aspirations. Ethnic violence was kept in check for some four decades during the communist regime of Tito. Old hatreds erupted with the dissolution of the former Yugoslavia in the early 1990s. Among the war's many victims was the Danube and the millions living downstream from the conflict.

A body of customary and conventional law has developed addressing what nation states may do when at war. Initially directed at protecting civilians, it has more recently begun to address the environment. A special article to Protocol 1 of 1977 on the Protection of Victims of International Armed Conflicts prohibits acts that may cause widespread, long-term, severe damage to the environment, as well treating as "war crimes" attacks taken against the natural environment by way of "reprisal" (Westing, 1990). Subsequent international agreements have attempted to strengthen these protections. Unfortunately, deliberate hostile acts against non-combatants were not uncommon during the Balkan conflict.

The war resulted in the destruction of both industrial and domestic wastewater treatment plants throughout the basins of the Drava and Sava rivers, major tributaries to the Danube (Rose, 1993a). Contaminated runoff from destroyed industrial sites and factories remains a concern. A frequently reported problem was the spillage of polychlorinated biphenlys (PCBs) from transformers and other electrical equipment at the many towns devastated by the conflict (Rose, 1993a, Gross, 1993, and Buska, 1995).

In the heavily bombed Bosnian town of Tuzla at least 80,000 metric-tons of oil is thought to have been spilled into a nearby river from a large chemical works (Rose, 1993a). During the conflict, the Bosnian Serb Army is reported to have averted the Muslim sabotage of a highly poisonous waste storage dam that drains into the Drina river and, ultimately, to the Danube (Foreign Broadcast Information Service (FBIS), 1994).

Attacks on Croatian oil refineries at Sisak and Bosanki Bord released significant quantities of oil and other hazardous materials. The Sisak refinery alone was hit by some 200 missiles, releasing an estimated 12,000 tons of oil and derivatives into the Sava River, oil slicks floating to Belgrade some 350 kilometers downstream. Damages were placed at $150 million and bans were placed on domestic and agricultural uses of the river's water. Reportedly this may have been the worst chemical catastrophe in Croatia during the fighting.

Hostilities also forced many municipalities to abandon their solid waste landfills and to dump rubbish into the nearest river or sea to control pests and prevent the outbreak of disease. In Osijek, Croatia the United Nations negotiated an agreement on solid waste disposal between warring sides to prevent waste from being dumped directly into the Drava River (Busak, 1995).

Heavy armament used in the conflict typically contained large quantities of oils and smaller quantities of PCBs. In the battle around Vukovar, 300 tanks were reportedly destroyed, each tank containing on average 50 liters of PCBs, 50 liters of hydraulic fluid, and 1,000 liters of diesel fuel (Buksa, 1995). There is also a growing concern over weapons, explosives, and other chemicals believed buried or destroyed by military forces as they were retreating. The long-term impact from the release of pollutants on the food chain and to human health is unknown. In Croatia, many industrial plants, known to be heavy polluters before the war, may not be rebuilt.

There have also been claims made by the Human Rights Watch in testimony to the U.S. Congress that the Serbian military may have used a chemical warfare agent that causes psychological and physical incapacitation against Muslims fleeing Srebrenica in 1995 (Gutman, 1998). The Pentagon, who challenged the group's credibility and lack of evidence, disputed this allegation.

Environmental protection had remained a lower priority in the rebuilding of Bosnia- Herzegovina, and is not specified in the new constitution (Csagoly, 1997). Little remedial work had been undertaken because of a lack of funding (Rose, 1993b) and over concerns for worker safety and security. There had been virtually no monitoring of air, water, or soil pollutants for over six years.

The Office of the High Representative (OHR), a United Nations-led independent body established to implement the Dayton Accords, has been increasingly involved in the development of environmental law for Bosnia-Herzegovina. Complicating this process is that Bosnia-Herzegovina remains divided politically, with two separate entities, the Muslim/Croat "Federation" and the Bosnian Serb "Republic of Serpska." A draft environmental law has been drafted amongst both entities with the assistance of the OHR (Simpson, 1997).

Ethnic unrest had also been escalating in the Kosovo province of the Federal Republic of Yugoslavia (FYU) since late 1997, when the secessionist Kosovo Liberation Army (KLA) took up arms against the Serbian government to demand an autonomous and coequal state. Tito originally established the Albanian province, but placed it within the Serbian Republic (Kaplan, 1994). Approximately 90 percent of Kosovo remains ethnic Albanian while the majority is Muslim. The FYU is comprised primarily of ethnic Serbian and Christian Orthodox. Fighting through early August 1998 took some 500 lives (Jensen, 1998), with the number of displaced estimated at over 250,000. Serb forces continued to have the military advantage in the fighting, and the NATO Alliance was seriously considering its military options.

The seeds of the ethnic divide in Kosovo can be traced back centuries with ethnic Albanians claiming descent from the Illyrians, until being conquered by the Serbs and other Slavs. The province of Kosovo also still stirs strong emotions with Serbians dating back to 1389 when, in one of the largest battles ever fought, a Christian alliance blocked the advance of an invading Ottoman army (Danforth, 1990). The region was ultimately conquered seventy years later by the Ottoman Turks. Illustrating this long-standing ethnic division, in 1989, over a million Serbs visited the medieval battle site to honor their heroic knights. Serbians have not forgotten this loss, nor their exploitation during Muslim rule (Kaplan, 1994).

The United States originally had 20,000 troops at the peak of its support to NATO's Balkan peacekeeping operations. NATO's options for potential intervention in Kosovo have been unattractive, both militarily and politically (Jensen, 1998). The size of any operation to enforce peace in Kosovo was envisioned to be staggering and, thus, Western powers have been reluctant to commit additional resources to the Balkans.

## 5.7 Environmental Disasters

Prevention of nuclear accidents remains one of the top environmental challenges most often identified by policymakers as facing the CEE region (Auger, 1997). This is likely attributed to a widespread apprehension that the general public has with exposure to radioactive fallout similar to that experienced by the 1986 Chernobyl accident. This incident remains a vivid memory with most Europeans who continue to have grave concerns with the poorly constructed and maintained Soviet-built reactors, eighteen sited in the Danube Basin.

Considerable work has been accomplished by those countries having Soviet-designed plants to improve their safety, often with outside international help. However, these efforts are not believed sufficient to bridge the gap between established international safety practices and the current level of operations and maintenance of Soviet-designed reactors (ERBD, 1996).

The direct health effects from such a Chernobyl-type disaster are not always detectable or well understood for many years. Those with access to information on the consequences of Chernobyl catastrophe were better able to respond, while those who stayed behind suffered depression and hopelessness (Trolldalen, 1992). Such accidents typically impart high levels of fear and psychological distress, which can also adversely impact the health of communities in both contaminated and uncontaminated areas (Herzman, 1995).

The likelihood of a catastrophic release of radioactive materials from a nuclear reactor is believed to be of low probability (Pirages, 1997). However, concerns over a lack of adequate design to address potential earthquake activity at many sites has prompted others to recommend that new construction techniques be applied in order to "seismic retrofit" these nuclear power plant facilities (Tarics and Kuntz, 1998). In addition to the environmental disaster that would ensue, the disruption in electrical production alone would likely create economic and political chaos in those Danube countries heavily dependent upon nuclear power (e.g., Czech Republic, Slovakia, Hungary, Bulgaria, and Ukraine).

In addition to Chernobyl, several technological and natural disasters have been catalysts for major changes in environmental protection and pollution practices in Western Europe. The 1986 Sandoz chemical plant fire resulted in some 40 tons of insecticides, herbicides, and fungicides being washed into the Rhine River near Basel, Switzerland, and a century of river overdevelopment contributed to the massive flooding experienced during the winter of 1994. This displaced some 250,000 Dutch at the river's mouth (Murphy, 1997).

Over the last two decades, thousands of accidental releases of pollutants into surface waters of the Danube Basin have occurred, while others have gone unreported. Such accidents have required the shutting off of drinking water intakes for impacted communities. The Tisza basin is known to have a continuing problem with releases of oils from broken and leaking pipelines (Pinter, 1997). The Danubian nations that lie in the middle and lower reaches of the basin are believed to be the most at risk from such accidental releases.

Lessons learned from past Rhine experiences include the importance of establishing emergency notification procedures for downstream government agencies and utilities, and the benefits of keeping the public informed about the situation as it unfolds. The Danube Basin, however, has additional challenges. It includes many more tributaries and countries and, therefore, any emergency warning system must be able to address more than just the three major languages required for the Rhine Alarm System (Pinter, 1997).

## 5.8 Regional Demographics

The current populations of the Danube Basin nations are relatively homogeneous, due in great part to an intentional mass movements of large ethnic groups following World War II (Clark, 1995). A regional demographic profile is provided in Table 5.9 (Page 65). The countries generally having the least homogeneity in ethnic and religious composition are those of the former Yugoslavia, a sub-region previously identified as being at the confluence of a number of "fault lines" important in European history (Huntington, 1993 and Davies, 1996).

# Table 5.9: Regional Demographics for Danube River Basin

| Country | National Population (millions)(1) | | Average Annual Populations Change (%)(1) | | Life Expectancy at Birth (years)(a)(1) | | | Major Religious Composition (%)(2) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Year 1998 | Year 2025 | 1995-2000 | 2005-2010 | 1975-1980 | 1995-2000 | Percent Change | Roman Catholic | Protestant | Orthodox | Muslim | Jewish |
| Austria | 8.2 | 8.3 | 0.6 | 0.1 | 72.0 | 77.0 | 7% | 85% | 6% | | | |
| Germany | 82 4 | 80 9 | 0 3 | -0.1 | 72 5 | 76 7 | 6% | 37% | 45% | | | |
| Hungary | 10.3 | 8.7 | -0.6 | -0.5 | 69.4 | 69.0 | -1% | 68% | 25% | | | |
| Czech Republic | 10.2 | 9 6 | -0 1 | -0 2 | 70 6 | 72 9 | 3% | 39% | 5% | | | |
| Slovak Republic | 5.4 | 5.5 | 0.1 | 0.2 | 70.4 | 71.3 | 1% | 60% | 8% | | | |
| Slovenia | 1 9 | 1 7 | -0 1 | -0 3 | 71 0 | 73 5 | 4% | 72% | 1% | | 1% | |
| Croatia | 4.5 | 4.2 | -0.1 | -0.2 | 70 6 | 72.2 | 2% | 77% | | 11% | 1% | |
| Bosnia-Herzegovinia | 4 0 | 4 3 | 3 9 | 0 0 | 69 9 | 73 2 | 5% | 15% | | 31% | 40% | |
| Former Yugoslovia | 10.4 | 10.7 | 0.5 | 0.0 | 70.3 | 72.5 | 3% | | | 65% | 19% | |
| Albania | 3 5 | 4 2 | 0 6 | 0 8 | 68 9 | 70 9 | 3% | 10% | | 20% | 70% | |
| Bulgaria | 8.4 | 7.5 | -0.5 | -0 4 | 71.3 | 71.3 | 0% | 1% | | 85% | 13% | |
| Romania | 22 6 | 21 1 | -0.2 | -0.2 | 69 6 | 69 5 | 0% | 6% | 6% | 70% | | |
| Ukraine | 51.2 | 46.0 | -0.4 | -0.4 | 69.3 | 68 8 | -1% | | | | | |
| Poland | 38 7 | 40 0 | 0.1 | 0 2 | 70.9 | 71 1 | 0% | 95% | | 5% | | |
| Moldova | 4.5 | 4.9 | 0.1 | 0 4 | 64.8 | 67.5 | 4% | | | 98% | | 2% |
| Switzerland | 7 4 | 7 6 | 0 7 | 0.2 | 75 2 | 78 6 | 5% | 47% | 40% | | | |
| Italy | 57.2 | 51.7 | 0 0 | -0.3 | 73.6 | 78.3 | 6% | 100% | | | | |

Note taken from WRI, 1998 directly

a The average number of years that a newborn is expected to live if the age-specific mortality rates effective at the year of birth apply throughout one's life

Sources (1) World Resources 1998-1999 - A Guide to the Global Environment, 1998, Oxford University Press, copyright 1998 WRI, data tables adapted by permission of World Resources Institute (WRI)
(2) Wright, 1997

There is a significant Hungarian minority of some 10.7 percent within the national borders of the Slovak Republic. Hungary claims that the historical suppression of ethnic Hungarians, currently some 600,000, continues in the new Slovak Republic. Similar claims have been made by Slovakia against forced assimilation policies Hungary has applied to its minorities (Slovakia, 1993).

The relative breakout of major religions in each of the Danube countries is also shown in Table 5.9. Christian Orthodox is the primary religion in the lower reaches of the Danube region (e.g., Bulgaria, Romania, and Ukraine), while Roman Catholic or Protestant religions dominate in the upper reaches (e.g., Austria, Germany, Croatia, and Hungary). Islam is the primary religion in Bosnia-Herzegovina and Albania and a significant minority religion in the former Yugoslavia and Bulgaria. Muslims are one of the fastest growing populations in Europe (Danforth, 1990). Islam is also growing fast in the United States, overtaking Judaism as the second most commonly practiced religion (Blank, 1998).

**Life Expectancies**

Population growth for most European and the CEE nations are projected to decrease over the next quarter century (Table 5.9). Even for countries showing an increase in projected populations, the growth rates are relatively modest compared to other parts of the developing world, which are increasing overall at a rate of 1.4 percent. Whereas Europe's average annual population is declining at 0.1 percent, by comparison, the population on the African continent is increasing at an estimated 2.5 percent per year, which is having a significant impact on the natural resources required to support such an exponential growth (WRI, 1998).

While infant mortality has been in sharp decline throughout the region (EBRD, 1997) an emerging gap in life expectancy after age 30 between CEE and Western European nations was reported based on a comparison of data for the periods 1946 to 1952 and 1984 to 1987 (Hertzman, 1995). This gap had apparently widened over the last three decades. Environmental pollution was dismissed as the principal cause of the gap, as was lower health expenditures by CEE nations. Interestingly the EU Statistical Office suggests that EU babies born today could have life expectancies of 87 for girls and 83 for boys (Eurostat, 1997a).

Hertzman (1995) introduces a hypothesis that the authoritarian social, political, and economic character of the CEE nations beginning in the 1960s created a climate of powerlessness and alienation that increased societal stress and created undesirable working conditions which adversely affected population and health. Hungary was used as an illustrative case study, since at the time it suffered the worst health status in the region, without the severe pollution problems of other countries such as Poland and the Czech Republic.

The hardships and heaviest sacrifices in increased poverty and growing inequality that accompanied the first phase of economic transition within CEE and, in particular, the former Soviet Union is believed over. There is little doubt that this transformation has contributed to health problems and social maladies such as significant increases in death due to heart diseases, a higher rate of suicides, and the spread of infectious diseases (EBRD, 1997). Male life expectancy in Russia, for example, has declined six years since the fall of the Berlin Wall.

With the exception of Hungary and the Ukraine, however, life expectancy at birth for the Danubian countries today has shown a marked increase compared with that in the late 1970s (Table 5.9). Lifespans for the Czech Republic, Slovenia, and Bosnia-Herzegovina currently exceed that for Europe as a whole.

The region has also become more susceptible to both new and resurgent pathogens, especially with the increased movement of people in a more mobile modern society and an influx of refugees (Pirages, 1997). Many of the CEE countries are attempting to establish regional transportation hubs adjacent their major cities. This will accelerate the spread throughout the region of any imported infections disease.

The aging populations of the region will become increasingly more vulnerable to new and mutating forms of viral and bacterial microorganisms, given their less resistant immune systems. Cholera and hepatitis outbreaks have recently occurred in the region (Pirages, 1997). The mobility and changing demographics of many nations will result in rising social and health related costs well into the next millennium.

**Refugees and Immigration**

Refugees receiving United Nations assistance in Europe increased sharply from about one million in 1992 to a peak of close to eight million in 1996, but has dropped steeply over the last two years to below six million (Brown, et. al, 1998). Germany hosts one of the world's top three refugee populations of about 1.3 million. What is not adequately reflected are the numbers of refugees increasingly shut off from safe havens, forced to remain in their own countries and, thus, subjected to continued victimization.

Regional conflicts have historically resulted in mass movements of refugees. There was an optimism that many of the social and economic problems of the centrally-based Warsaw Pact economies would improve rapidly after the end of the Cold War. Unfortunately, with the dissolution of the former Yugoslavia, bitter and historic ethnic hatreds have surfaced once again in the region, after forty years of being suppressed under authoritarian rule.

The Balkan War displaced over 700,000 people (Csagoly, 1997). Murphy (1997a) placed the number much higher, at two million. At the onset of the Kosovo conflict, more than 100,000 people were driven from their homes (Thompson, 1998), in what the United Nations High Commissioner for Refugees compared to the ethnic clearing that happened in Bosnia in the early 1990's (AP, 1998). Most of these refugees fled to neighboring Albania and Macedonia, but many are expected to eventually reach Western Europe (Jensen, 1998). Refugee camps have the potential to adversely impact local ecosystems and waterways if not properly sited and operated.

Refugee resettlement can be costly in terms of monetary and social terms. Some 350,000 refugees of the earlier Balkan conflict settled in Germany alone, at a cost of $8 billion (Clark, 1995). Given the continued instability in the Balkans, the need to absorb more refugees will put increased pressure on the various member nations of the European Union to provide assistance. In Germany, the assistance provided to date has triggered some isolated incidents of violence against both refugees and immigrants. This can be attributed to the current economic slowdown and higher unemployment rates being felt by many industrial sectors.

The United States Secretary of State recently delivered veiled criticism of Germany for its accelerated repatriation of some 75,000 refugees, using both financial incentives and force. Reportedly, one-third of the repatriations occurred in July 1998 alone (Latal, 1998). The Secretary voiced concerns over the irresponsibility of forcing refugees to return "where there is no security, no housing, and no jobs." The German reaction was to restate the support the government has provided refugees to date and to stress that advice on this issue is not needed.

Environmental degradation and resource scarcity within CEE is believed unlikely to trigger any major displacement of people (Pirages, 1997). However, the hazards and pollution related to nuclear power sta-

tions, the resulting nuclear waste, and severe air pollution in the "Black Triangle" area of southwest Poland, northwest Czech Republic, and southeast Germany are suggested as presenting potential risks of "environmental refugees" in the region (Trolldalen, 1992). Europe must also cope with its immigration policies.

It was estimated in the late 1980s that 100 million people worldwide lived outside their own country in order to find work or be with family, generating more than $65 billion a year, a figure larger than for all official development assistance (Kane, 1995). During the rapid economic growth and labor shortages of northern Europe in the 1960s, many nations, including Germany, recruited "guestworkers" from Italy, Turkey and Algiers. International migration for economic and other reasons is now responsible for 88 percent of the population growth rate in Europe, an estimated influx of 739,000 immigrants per year (WRI, 1998). Past emigration from high birth rate nations to both the United States and Europe has served as a form of "safety valve," but that valve may soon be closing (Hardin, 1985).

Recently, European countries are considering more restrictive immigration policies. The European Union is committed to removing all frontier controls between member states to ensure full freedom of movement of its citizens. To alleviate fears of unchecked immigration and lessened security, it is stressing that its member states will need to reinforce border control at the "external frontiers of the Union" (EU, 1996a). Europe and CEE countries are facing declining rates of population growth and, thus, will need to reconsider their respective immigration policies to ensure a trained workforce in both the service and technical sectors.

## 5.9 Case Studies

The following three case studies are offered as representative of environmental security issues that have led, or could easily lead, to increased instability in the Danube River Basin. Each case is unique with complex and interrelated cultural, social, economic, political, and environmental security issues. Thus, the ensuing discussion of the cases will be limited to a summary, highlighting the more notable points of the case. These topics are recommended for further study by those interested in environmental policy, conflict, or security studies.

### 5.9.1 Case Study 1 - Mochovce Nuclear Power Plant

Austria and the Slovak Republic came to political blows in June 1998 when the Slovakian Prime Minister ordered the first of two reactors of the Mochovce nuclear power station complex to begin operation. Public outcry prompted Austria to recall its ambassador.

The plant is located approximately 120 kilometers from the Austrian border. It is ironic that this announcement coincided closely with the twelfth anniversary of the Chernobyl nuclear reactor melt-down in the Ukraine. The second reactor is scheduled to go on-line in early 1999 (Javurek, 1998).

The Slovak Republic is dependent upon nuclear power for most of its electrical production. Austria fiercely opposes nuclear power programs, relying heavily on a series of hydroelectric plants along the Danube River for its electrical needs. Austria has repeatedly argued against the upgrade and construction of poorly built and operated Soviet-type nuclear reactors in both the Czech and Slovak republics. Austrian attempts included an offer to the Slovak government of $50 million in 1995 to convert the Mochovce plant to a gas-fired system (Spolar, 1995). This offer was not accepted.

Construction of the plant was started in the mid-1980s but was suspended in 1989 for financial and safety reasons (Javurek, 1998). Various environmental NGOs and other activist groups have fought strenuously over the last several years to keep the plant from opening. Pressure from these groups, the Austrian government, and from the European Parliament were persuasive in the EBRD's decision to withdraw its planned financial support (GLOBE, 1998). Private capital, however, was obtained to complete the project.

Earlier arguments provided by the EBRD against construction of the Mochovce plant include claims that the Slovakian government overestimated its future electrical energy needs and will be exporting excess electricity to other countries to pay for the project (Weller and Froggatt, 1994). Cost estimates for construction and operations also did not adequately consider long-term waste disposal or decommissioning of the reactors. Other options were provided addressing current energy inefficiencies in Slovakia.

Concerns were also voiced by both Slovakia and the EBRD that construction of the plant would ensure less dependency on Russian gas. Reportedly, however, the Slovakian gas system has been an integrated part of the larger European gas grid for over twenty years.

The Slovak Republic claims the plant is safe and has been upgraded to the standards of the International Atomic Energy Agency (Javurek, 1998). Additionally, it is reported that the operator (e.g., Slovenske Elektrane) for both the Mochovce and Bohunice nuclear plants has signed a contract with a Russian firm to supply nuclear fuel rods after 1999.

### 5.9.2 Case Study 2 - Gabcikovo-Nagymaros Hydroelectric Power Plant Project

In October 1992 Slovakia diverted the Danube along their shared border with Hungary into a hydrological complex consisting of a 62 square-kilometer reservoir, a 40 kilometer elevated concrete and asphalt lined canal, and a huge dam which powers two large hydroelectric turbines near the village of Gabcikovo. The project was mutually agreed to in a 1977 bilateral treaty signed by Hungary and Czechoslovakia. The Slovak Republic subsequently gained formal independence in 1992. An integral part of the original scheme was construction of a smaller hydroelectric dam at Nagymaros, whose primary purpose was to regulate surges from the operations at Gabcikovo.

The controversial Gabcikovo-Nagymaros Project acted as a "lightning rod", energizing protests by environmental and political activists, which eventually led to the downfall of the totalitarian regimes in both Hungary and Czechoslovakia. Many argue that this conflict also served as the catalyst which contributed in the late 1980s to the end of similar Soviet-backed governments elsewhere in Central and Eastern Europe, ending the era of the Cold War.

Citing environmental reasons, Hungary terminated construction of the Nagymaros portion in 1989. Hungary claims Slovakia is depriving a large Hungarian wetland of life-giving water and that both dams could concentrate pollutants thus endangering the largest underground aquifer in Central Europe, with an estimated capacity of 20 cubic-kilometers (Pearce, 1994). Conversely, the Slovakian government position is that the project will save remaining wetlands, create a cleaner aquifer, improve navigation, and provide a clean source of electricity. Both claim ethnic minorities, separated by the Danube, have suffered some form of suppression by the other.

Growing Hungarian opposition to the scheme during the 1980s eventually halted construction at Nagymaros, leaving the Slovaks to pursue a "C-variant" of the original plan. This option required Slovakia to extend the length of the diversion canal by an additional 9-kilometers, to its current 40 kilometer length, where the site of the canal's diversion at Cunovo and both sides of the canal are on its sovereign territory. It allows Slovakia to address the issue of water management as an internal matter (Pearce, 1994). The Danube Commission had given its original approval in 1977 and continued to lend support during construction (Land, 1992b).

In 1985, over the objections of environmentalists, the Austrian government offered to pay 70 percent of the project costs to complete the Nagymaros portion of the project. In return, Austria, supportive and dependent on hydropower, was to be provided 1.2 billion kilowatts of electricity a year for 20 years (Hinrichsen, 1989). Opponents to the dam claimed that Hungary would only get the equivalent of about two percent of its yearly energy needs from Nagymaros.

Without the dam at Nagymaros, the Gabcikovo plant will never be able to operate at maximum capacity. The Gabcikovo plant currently operates as a simple flow-through hydropower plant (Binder, 1993). Specifically, the Gabcikovo plant will only be able to produce 180-megawatt of its originally planned 780-megawatt of electric power by 1995 (Land, 1992). At this lower level of operation, there is an expectation that Slovakia will divert more water back into the Danube's old riverbed (Rich, 1992).

In April 1992, the Czech and Slovak Federal Republic and Hungary asked the European Commission for assistance in resolving the dispute. Both parties had a strong desire to strengthen ties with the European Union. The European Commission underlined the need to find an urgent solution to the dispute to ensure continued stability in Central and Eastern Europe. After several trilateral meetings, no mutual agreement could be reached on the issue. On 7 April 1993, the State Secretaries of Foreign Affairs of Hungary and Slovakia, in the presence of the European Commission, signed the Special Agreement to submit the case to the International Court of Justice (ICJ) in the Hague.

A non-appealable decision from the 15-judge court, on 25 September 1997, found both sides at fault. The original 1977 treaty was ruled still valid and both parties were ordered to renegotiate the joint operation of the dam system, while respecting current environmental standards and compensate each other for damages incurred.

There has been concern among opponents that a joint solution may likely include resurrecting the Nagymaros dam or building another dam near Pilismarot (Weston, 1998a). Angered by unpublicized bilateral negotiations and the likelihood that the Nagymaros dam, a symbol of prior Soviet domination, might be rebuilt, 40,000 people protested their dissatisfaction outside the Hungarian parliament. Public opinion has forced the Hungarian government to notify the ICJ and Slovak government that it would not meet the court negotiation deadline of 25 March 1998. Additional environmental and economic studies will be conducted (Danube Watch, 1998a).

### 5.9.3 Case Study 3 - Giurgiulesti Oil-Importing Terminal

Moldova's entire catchment area comprises only about one percent of the entire Danube River Basin. However, this constitutes some 35 percent of the total country's land area. The Prut River forms Moldova's western national border with Romania but is also shared with the Ukraine, discharging into the main stem of the Danube River near Reni, Ukraine, some 150 kilometers before flowing into the Black Sea (Bularga, 1998). It

is at this confluence of the Prut and Danube where Moldova has its only access to the Danube River and, subsequently, the Black Sea. Oil pollution and heavy metals are reportedly the biggest threat along this Ukranian stretch of the Danube (Mossienko, 1997).

Moldova is critically dependent on imported energy sources. There are two existing oil terminals in the area of the Moldova-Ukraine-Romania border. The Ukranian two million-ton capacity oil terminal is not operational. Romania currently operates a five million-ton capacity terminal. Moldova had proposed an exchange of land for the Ukranian terminal, which was not accepted. Consequently, Moldova is building a similarly sized plant in the village of Giurgiulesti (Muller, 1998).

The Moldovan oil terminal is expected to be finished in 1999 with a $19 million financial packet, of which $9 million is being syndicated to several Greek banks (EBRD, 1998a). Expansion of the Giurgiulesti port would also allow for more economic water transit of other goods as well as for likely reducing the cost of imports. The site, however, is also only 300 meters from the Ukranian border, which has recently led to increased tensions. The site is also being built in a seismic area and is close to a natural and cultural protected reservation. There has been growing opposition to the terminal based on the devastating impact on the environment and human health and safety should a major accidental release ever occur, especially a catastrophic failure caused by an intense seismic event.

# 6. POLICY RESPONSES

The previous chapter addressed the environmental security issues believed most likely to impact regional stability within the Danube River Basin. There has been a concerted effort by both international and regional institutions to address the restructuring of the underlying social, economic, political, and environmental systems of many CEE countries to ensure their successful transition to market based economies and democratization. These institutions are also assisting interested CEE countries in their efforts to achieve the demanding criteria needed to join many of those same regional economic institutions and military alliances.

This chapter reviews the structure and capabilities of many of these institutions, focusing on initiatives taken to address, both directly and indirectly, the regional environmental security issues identified in the last chapter. This review is important in determining existing gaps or overlaps in policies and responsibilities, an important consideration in the next chapter. The discussion begins with a review of international agreements, often prompted by an historical event that have helped shaped the development of the Danube River Basin.

## 6.1 International Agreements

International agreements ensuring Danube navigation rights date back to the fourteenth and fifteenth centuries between the Hungarian kings and Wallachian (Romanian) princes. The early arguments tended to be bilateral agreements, which allowed concessions, but were worded to permit the local sovereign to easily withdraw support. During the establishment of the Christian nation states, the major rivers were important economic arteries throughout Europe. Each state, however, tended to exact exorbitant tolls while failing to clear obstacles to navigation from their section of the river. Treaties throughout the eighteenth century typically included legal provisions allowing for freedom of navigation, but, in practice, were not supported.

It was only at the Congress of Vienna in 1815 that nations took action to apply the provisions of free navigation seriously. It was agreed that while international rivers will be kept open, riparian states would maintain control and supervision. The Treaty of Paris in 1856 formally applied the provisions of free navigation as adopted at the Congress of Vienna to the Danube. The treaty also established two distinct commissions: a European Commission to improve the navigability of the Danube and to levy duties to cover such costs, and a Riparian Commission to prepare accompanying regulations governing navigation and policing on the river. The Riparian Commission that was established became ineffectual as a result of the interference from key non-riparian nation states (e.g., England) and the domination of Austria. The failure of the Riparian Commission did not significantly impact continued trade along the Danube.

The European Commission functioned through many conflicts, such as the Crimean War, and continued in existence until the Treaty of Bucharest in 1917, when Romania fell and the Central Powers abolished it, and replaced it with a commission dominated by Germany and Austria (Shafer, 1948). The Treaty of Versailles in 1919, broke up the Hapsburg Monarchy following the World War I, provided international status to the Danube. This treaty revived the European Commission and formed an International Danube Commission to control most of the river. The bankrupt condition of Central and Eastern Europe following the war prevented the undertaking of large, and needed, improvement projects along much of the Danube. Nazi Germany opposed the European (Danube) Commission at every opportunity and withdrew support in mid-1930.

The Belgrade Convention of 1947 was a landmark multi-lateral agreement that established a "new" Danube Commission and a formal mechanism for resolving conflicts. The convention required Danubian

nations to maintain their section of the river in a navigable condition (Westing, 1989b). The headquarters of the Danube Commission were relocated to Budapest in 1954, where, for the last 46 years, it has been primarily concerned with the development of regulations for navigation and safety.

It has been only recently that environmental concerns been addressed. Reportedly, there are over 110 bilaterals and multilateral agreements now regulating water quality and usage in Europe (Pirages, 1997). A summary of the major international agreements that have influenced navigation and later environmental management within the Danube River Basin is provided in Table 6.1 (Page 84).

## 6.2 United Nations Involvement

The UN is represented both on the Danube and Black Sea Environmental Programs. It is an active member of the Danube River Environmental Program Task Force. The significant contribution made by the Global Environmental Facility (GEF) in staffing and funding the Danube program will be discussed in more detail later in this chapter. The GEF also supports biodiversity projects in the Danube Delta. A short background on the UN and several key agencies supporting the CEE region will be presented in this section.

### International Peacekeeping Organization

The United Nations (UN) was created in 1945 after World War II as an international peacekeeping organization. It was a UN-backed military effort that first intervened in the Balkan conflict. The UN charter requires the organization to:

- maintain international peace and security;
- develop friendly relations among nations;
- cooperate in solving international problems of an economic, social, cultural or humanitarian character and promote human rights, and;
- act as a center for harmonizing the actions of nations in the attainment of these common goals (Wright, 1997).

The UN is limited by its current organizational setup, which has been suggested as not being appropriate to intervene in international environmental conflicts without many doctrinal changes. (Trolldalen, 1992). The UN is also limited by the authority that sovereign nations are willing to subscribe to it. The UN's early peacekeeping role is believed now to be overshadowed by its involvement with social, economic, and development issues (Trolldalen, 1992). The UN system includes specialized agencies and autonomous organizations to implement its stated goals, many of which have institutional resources that can be called upon to help prevent and resolve international environmental conflict.

### International Court of Justice

The International Court of Justice (ICJ) is one of the UN's principal organizations and one of the few judicial institutions the world community can use for conflict resolution. Excepting Switzerland, all UN members states are also members of the ICJ. The Courts consists of 15 judges from different nationalities elected by the General Assembly and Security Council for nine-year terms. The Court sits at the Hague, Netherlands, its purpose to issue judgments that member states refer to it, on issues related to the UN Charter, and on issues dealing with international treaties and conventions that are in force. Its judgments are final and binding, without appeal. Although independent of other UN organizations, its role in resolving international environmental conflicts has been historically weak (Trolldalen, 1992).

## Table 6.1 - International Agreements Impacting Danube River Basin

| Treaty/Agreement | Focus |
|---|---|
| Congress of Vienna (1815) | Remodeled Europe after Napoleonic Wars - established rule that international rivers would be administered for the benefit of world commerce, but their administration and navigation were to be left in the hands of the riparian States - with lower reaches of the Danube in hands of Ottoman Empire no practical measures could be taken. |
| Treaty of Paris (1856) | Ended the Crimean War - put forward program for developing the river [new wharves and harbors] - established the European Danube River Commission and a Riparian Commission. |
| Treaty of Versailles (1919) | Provided international status to the Danube River - revived the European Commission and established International Danube Commission. |
| Convention of Paris (1921) | Established provisional membership of the DanubeCommission. |
| Belgrade Convention (1947) | Socialist riparian countries established a new Danube Commission [Austria acceded in 1955, Germany in 1989] - lays down regulations to regulate shipping [navigation and safety] - signatories maintain their section of river - compulsory conciliation. |
| Vienna Treaty (1955) | Navigation shall be free and open for vessels of commerce and goods of all nations - no provisions for conflict resolution. |
| Bucharest Convention (1958) | Parties shall improve the natural conditions for fish breeding and shall safeguard the normal migratory movements of fish. |
| Ramsar Convention (1971) | Convention on wetlands of international importance - especially those that are important wildfowl habitats. |
| Bonn Convention (1979) | Conservation of migratory animals - complements Ramsar Convention. |
| Bern Convention (1979) | Conservation of European wildlife and natural habitats. |
| LRTAP Convention (1979) | Several riparian nations are parties to the convention on Long- range Transboundary Air Pollution. |
| Bucharest Declaration (1985) | Highly principled attempt to establish a parallel Ecological Commission to the Danube Commission. |

**Table 6.1 (cont'd)**

| | |
|---|---|
| Environmental Programme for the Danube River Basin (1992) | Danubian countries and international institutions met to obtain support and reinforce national actions for the restoration and protection of the Danube River Basin. |
| Convention Watercourses and International Lakes (1992) | Strengthens the protection and ecologically sound management of surface and groundwaters by providing a framework for regional cooperation on transboundary problems. |
| Convention on Biological Diversity (1992) | Signed at UCED - objectives are the conservation of biological diversity, the sustainable use of natural resources, and the fair and equitable sharing of the benefits of the use of genetic resources. |
| Environmental Action Programme for Central and East Europe (1993) | EAP represents broad consensus on environment and development; sustainable development; institutional capacity building; emphasis on "worst first" problems. |
| Convention on the Black Sea (1993) | Lists regional and national actions to be taken by the Black Sea states to rehabilitate, protect and preserve the Black Sea. |
| Convention on Cooperation for the Protection and Sustainable Use of the River Danube (1994) | The Convention is aimed at achieving sustainable and equitable water management. Signatories have agreed on the conservation, improvement, and rational use of surface and groundwaters; to control hazards originating from accidents involving hazardous substances, floods and ice; and to contribute to reducing loads of the Black Sea from sources in the catchment area. |

Sources Westing, 1989b, Rich, 1991, EPDRB, 1995, Shafer 1948

The Court has been active on environmental issues. It recently issued a ruling on the Gabcikovo-Nagmaros hydroelectric dam project on the Danube River, a contentious issue between Hungary and the Slovak Republic for several years. This project and the ICJ ruling are discussed as a case study in the previous chapter.

**The World Bank**

The World Bank Group consists of five closely related institutions: the International Bank for Reconstruction and Development (IBRD), the International Finance Corporation (IFC), the International Development Association (IDA), the International Monetary Fund (IMF), and the Multilateral Investment Guarantee Agency (MIGA) (Wright, 1997). The World Bank Group plays a crucial role in promoting sustainable development for borrowers. In this role, it has become more sensitive that projects it supports pay special attention to environmental issues. It also publishes numerous reports on related social, economic, and environmental topics, to include its annual World Development Report. The Bank continues to be an active participant on the Environmental Programme for the Danube River Basin Task Force and, as such, helps ensure development of a sound strategy of projects which address high priority environmental issues in support of the program's Strategic Action Plan (EPDRB, 1996).

**UN Environmental Program**

The UN Environmental Program (UNEP), headquartered in Nairobi, Africa, is responsible for exercising environmental leadership for a multitude of international environmental programs and initiatives throughout the UN system. UNEP's European Regional Office is located in Geneva and serves primarily as the center for international treaties and major programs dealing with the environment and sustainable development sponsored by UNEP. Examples of international agreements supported by Geneva include the Basel Convention on the Transboundary Movement of Hazardous Wastes, the Conventions on Biological Diversity, Climate Change, International Trade in Endangered Species, Migratory Species, and the Montreal Protocol (UNEP, 1998).

**UN Statistical Division**

The UN Statistical Division (UNSTAT), located in New York City, is responsible for the collection and dissemination of relevant economic, social, environmental, and other data, and for improving the statistical capabilities of its member states. UNSTAT maintains extensive data bases and produces numerous statistical reports. Following a recommendation made at the 1992 UN Conference on Environment and Development, the Division has made significant contributions in the fields of environmental statistics, indicators for environmental and sustainable development, and the integration of environmental and economic accounting (UN, 1997). UNSTAT, UNEP, and the UN Economic Commission for Europe recently collaborated on a "Workshop on Environmental and Natural Resource Accounting with Particular Reference to Countries in Transition to Market Economies" (UN, 1994).

**International Atomic Energy Agency**

The International Atomic Energy Agency (IAEA) is a specialized agency of the UN. The IAEA was founded in 1957 to provide technical advice and assistance to developing countries on nuclear power development, nuclear safety, the proper management of radioactive wastes, and other nuclear related efforts. The IAEA is also the primary international organization with responsibility for safeguarding nuclear material or equipment from being diverted from peaceful application to the production of nuclear weapons. In this role it

has some 214 safeguards agreements in force and conducted over 2,400 inspections in 1996 (IAEA, 1998). Membership in the IAEA totals 127 nations with a 1988 annual budget exceeding $221 million. It has three major international laboratories and research centers coordinating hundreds of research projects and active research contracts and agreements. IAEA has been providing nuclear power plant safety assistance to CEE countries and the former Soviet Union.

## 6.3 Environmental Action Program

An Environmental Action Program (EAP) for Central and Eastern Europe was initiated by European Environmental Ministers from east and west, the United States, and Canada at the first "Environment for Europe" Conference held in Dobris, Czechoslovakia, June 1991. The EAP was endorsed at the second Ministerial Conference in Lucerne in April 1993, when a task force was established to facilitate implementation of the program. The EAP promotes a mix of policy reforms, institutional strengthening, increased cooperation and exchanges, and foreign assistance as a means for addressing environmental problems and taking action (REC, 1996).

Members of the EAP Task Force include CEE and Western governments, international financial institutions, and international and regional organizations. The Organization for Economic Co-operation and Development in Paris serves as the Secretariat (OECD, 1998a). The Environmental Ministers also established a Project Preparation Committee (PPC) to facilitate the identification, preparation, and implementation of environmental investments in the CEE region. The European Bank for Reconstruction and Development (EBRD), headquartered in London, serves as the Secretariat to the PPC (REC, 1996).

The Task Force is assisting countries to develop and implement National Environmental Action Programs (NEAPs), strengthen financial mechanisms for environmental improvement, and instill stronger environmental management in regional enterprises (OECD, 1998a). The progress of CEE countries in implementing the EAP has been reviewed at both the third and fourth ministerial meetings held in October 1995 and May 1998, respectively. A summary of the status of NEAP development and overall CEE environmental policy reform was developed by the EBRD, and is provided at Table 6.2 (Page 88).

## 6.4 Environmental Programme for the Danube River Basin

Danubian countries and interested international institutions met in Sofia, Bulgaria in 1991 to establish an Environmental Programme for the Danube River Basin as a means of eliciting support for the restoration and protection of the Danube. A Danube convention was regarded as essential to ensure the sustainable development of the basin. These efforts were rewarded in 1994, when the eleven riparian countries of the basin signed an international convention aimed at tackling the pollution of the Danube (Rich, 1994). The "Danube River Protection Convention" addresses a wide range of topics related to the prevention, control, and reduction of anthropogenic pollution to both the Danube and Black Sea (DRPC, 1994).

Signing the convention was seen by many Danubian countries as a means of achieving harmonization with European water quality standards and leading to EU membership (Georgieva, 1998). Signatories to the convention, however, agreed to begin implementing key principles of the convention while awaiting its formal ratification. Ratification by nine of the eleven signatories was required for the convention to be automatically implemented. Ratification had been slow with the realization of the resource commitments necessary to fully implement the requirements of being a full member to the convention. Slovenia was the ninth Danube country to ratify the convention (Gorisek, 1998).

# Table 6.2 - Indicators of Environmental Policy for Danubian Transition Countries

| Country | International Treaties (s=signed; r=ratified; s&r=signed and ratified) | | | | | | | | Standards | NEAP |
|---|---|---|---|---|---|---|---|---|---|---|
| | Danube River Protection Convention (1)(a) | Black Sea Convention (2) | Wetlands (3)(b) | Endangered Species (3) | Montreal Protocol (3) (c) | Climate Change (3) | Biodiversity (3) | Trans-boundary (3) (d) | Air and Water (Effluent Index) (3) (e) | Status of NEAP or Equivalent (3) (f) |
| Hungary | s&r | | s&r | r | r | s&r | s&r | s&r | 3 | 1 |
| Czech Republic | s&r | | s&r | r | r | s&r | s&r | s | 3 | 1 |
| Slovak Republic | s | | s&r | r | r | s&r | s&r | s | 2 | 1 |
| Slovenia | s | | s&r | | r | s&r | s&r | s | 2 | 2 |
| Croatia | s&r | | s&r | | r | s&r | s&r | r | 2 | 2 |
| Bos.-Herzegovinia (g) | na | | | | r | | | | na | 2 |
| Form. Yugoslovia | na | | | | | | | | | |
| Albania | na | | s&r | | | s&r | s&r | s&r | 1 | 1 |
| Bulgaria | s | s&r | s | r | r | s&r | s&r | s&r | 1 | 2 |
| Romania | s&r | s&r | s&r | r | r | s&r | s&r | s | 2 | 1 |
| Ukraine | s | s&r | s&r | | s&r | s&r | s&r | s | 1 | 1 |
| Poland | na | | s&r | r | r | s&r | s&r | s&r | 3 | 1 |
| Moldova | s | s&r | | | r | s&r | s&r | r | 1 | 1 |

Notes (taken from sources directly)

a Data as of 1997, Slovenia was ninth nation to ratify - the Convention legally entered into force on 22 Oct 98

b Ramsar Convention on wetlands of international importance, especially wildfowl habitat

c Protocol that addresses substances that deplete the ozone layer

d Convention on the protection and use of transbounary watercourses and international lakes

e "1" means max permissible concentrations (MPC) system in place, broadly based on former Soviet system,
"2" means a new system is being introduced, either as an evolution of MPC or in order to meet EU requirements,
"3" means essentially new standards system is in place, often following EU requirements

f National Environmental Action Plan (NEAP) "1" means prepared or under implementation, "2" means planned or under preparation

g Bosnia and Herzegovina to introduce new legislation following recent political changes

Sources (1) Annual Report, 1996, Environmental Programme for the Danube River Basin (EPDRB), adapted by permission of the Danube Programme Coordination Unit

(2) Strategic Action Plan for the Danube River Basin - 1995-2005, 1995, EPDRB Task Force, adapted by permission of the Danube Programme Coordination Unit

(3) Transition Report 1997 - Economic Transition in Eastern Europe and the Former Soviet Union, 1997, Litho-Tech Colour Printers Limited, copyright EBRD 1997, adapted by permission of the European Bank for Reconstruction and Development (EBRD)

**Regional Planning and Implementation**

One of the initial major tasks of the Environmental Programme for the Danube River Basin was the three-year development of a regional Strategic Action Plan (SAP). Completed in 1994, it was approved by the Environmental Ministers of the Danubian States and the Environmental Member of the European Commission. The stated goals are:

- provide a needed framework to improve the aquatic ecosystem and biodiversity in the Danube;
- reduce pollutant loads entering the Black Sea;
- maintain and improve the availability and quality of water in the Danube River basin;
- control resulting hazards from accidental spills, and;
- develop regional water management cooperation.

The SAP lays out specific strategies with short (less than three years), medium (less than 10 years), and long-term targets and actions to achieve them. Actions are specifically directed at those key actors of change previously listed. It was planned to update the SAP after three years. This would allow for an evaluation of progress made against short-term targets.

In 1996, a Strategic Action Plan Implementation Program (SIP) was initiated to transition from the first phase of data collection, problem definition, monitoring, and establishing an accidental pollution warning system within the SAP, to an implementation phase. The SIP is a program of demonstration projects broken into six major groups, further subdivided into clusters. The six major project groups include: contaminants and human health, sustainable land use, wetlands and nature conservation, sustainable use of water resources, institutional capacity building, and basin-wide projects (EPDRB, 1996).

**National Action Plans**

While the SAP provides the framework for an integrated regional approach, its success is dependent upon the development and implementation of accompanying National Action Plans (NAPs) by each of the Danubian countries. A summary of the progress made by the different countries in the preparation and approval of their respective NAPs, as of January 1997 is provided in Appendix G. Several countries are incorporating their NAP into their broader National Environmental Action Programs (NEAPs), a separate initiative discussed in the preceding section on the European Action Program. CEE countries are undergoing a rapid transformation of their economic systems, and the availability of needed capital to implement their respective NAP remains a major concern.

Financial assistance to support studies, projects, planning, infrastructure investment, and operation and maintenance to implement the various NAPs is envisioned to come from a variety of sources. Long term financing will be domestically based from charges from user (consumer) fees, pollution fees and fines, and economic and financial incentives. External resources will be required in the near future from grant institutions and foundations such as the Global Environmental Facility (GEF) and loans from international and financial institutions such as the World Bank and European Bank for Reconstruction and Development (ERBD).

**Organization and Funding**

The need to establish a coordinating body (e.g., a task force) to oversee the development and implementation of the Danube River Environmental Program and a staff to provide the day-to-day support were

identified at the 1991 Environmental Ministerial meeting in Sofia, Bulgaria. International support staff have been provided through a program coordination unit (PCU), jointly staffed by the European Commission and UN. The organizational relationships of the PCU, the interim International Secretariat, task force members, and various sub-groups are depicted in Appendix H. The PCU is envisioned to transfer many of its duties to a permanent Secretariat to be established within the International Commission for the Protection of the Danube River, once the Convention enters into force.

Membership of the Task Force includes country program coordinators from each of the participating Danube nations, international donor agencies and financial institutions, and NGOs such as: the United Nations, European Commission, World Bank, European Investment Bank, USAID, World Wide fund for Nature, the Black Sea Program, and the Regional Environmental Center (EPDRB, 1998a). Equipe Cousteau, involved heavily in earlier technical baseline surveys of the Danube, was also a past member. Other organizations are invited in an observer status (EPDRB, 1996).

The PCU comprises a six-person PHARE Team and a four-person GEF Team of environmental, finance, and project implementation experts located in the UN complex in Vienna, Austria. The PCU supports the activities of the Task Force. Several existing expert sub-groups, have been established under the current PCU, focusing on: monitoring, laboratory, and information management; data management; an accidental early warning system; and emission issues.

PHARE is the program of European assistance to CEE countries, while TACIS is a similar program to assist the Commonwealth of Independent States, that include the Danube nations of Moldova and the Ukraine (EU, 1997a). The Global Environmental Facility (GEF) was established in 1992, following the Rio Earth Summit, as a multilateral financial mechanism to provide grants to developing countries supporting biological diversity, international waters, climate change, and ozone depletion. Its implementing agencies are the United Nations Development Program (UNDP), the UN Environmental Program (UNEP), and the World Bank (Danube Watch, 1998b).

The PCU-PHARE Team is responsible for the planning and coordination of Task Force meetings, facilitating member involvement and information sharing among participating countries, monitoring all Danube program activities, and preparing reports to the Task Force on program activities. The PHARE Team's emphasis is on developing environmental conditions in the region to facilitate accession to the EU, while the GEF Team remains more broadly focused on regional cooperation for water management to reduce transboundary effects and to protect aquatic systems in both the Danube River Basin and the Black Sea.

Since the inception of the Danube Program, the European Commission and the United Nations have provided substantial technical and financial assistance. From 1992 to 1996, the PHARE and TACIS programs contributed some $16.4 million and the UNDP/GEF approximately $8.5 million. The EU provided an estimated 6 to 9.5 million and the UN provided an additional 3.9 million for the period 1997 to 1998 (EPDRB, 1998b).

With the final required ratification of the Danube Convention, it became reality on 22 October 1999. The interim Task Force and PCU will be transitioning to a permanent organizational structure under the International Commission for the Protection of the Danube River (ICPDR). One proposed final organizational structure of the ICPDR is provided in Appendix I. The conference of the parties would meet at the ministerial level and set the policy framework for the program. The secretariat would provide the support to the international commission and several expert groups, formerly the PCU expert sub-groups. Financial support would be derived from member contributions (EPDRB, 1998b).

To provide continuity, it was proposed that a Project Management Task Force (PMTF) be established, derived from the current Task Force and PCU (EPDRB, 1998b). The PMTF would continue to seek PHARE/TACIS and GEF support. Some concerns have been raised with the role of PMTF in the ICPDR organization, especially since financial support for the ICPDR is contingent upon convention member contributions (EPDRB, 1998b).

**Pollution Reduction Program**

The Danube Pollution Reduction Programme (PRP) was launched in November 1997 "to define transboundary measures and actions and to develop an investment program for national, regional, and international cooperation to control and reduce water pollution and nutrient loads in the Danube River and its tributaries and their effects on the Black Sea ecosystems" (Weston, 1998b). Oversight of this UNDP/GEF funded initiative is currently provided by the Danube PCU-GEF Team.

The PRP is being developed within the framework of the Danube Convention, while also achieving the aims of National Action Plans (NAPs). It is believed that the PRP process will also encourage better coordination and avoid duplication between the Danube NAPs and National Environmental Action Plans (NEAPs). The PRP is also attempting to enhance NGO participation at both the national and regional levels which, reportedly to date, has been unsatisfactory (Pinguli, 1998).

It is also the intent of the PRP to strengthen some of the perceived weaknesses in the 1994 SAP and 1996 SIP. The SAP provides an excellent framework document but lacks financial mechanisms, does not set measurable targets, and does not adequately address transboundary pollution issues (Weston, 1998b). To date, SIP projects have been funded by PHARE. The SIP does not provide sufficient information on priority transboundary environmental problems to qualify for GEF funding (REC, 1997a).

An important end-product of the PRP effort is development of a revised Danube SAP having specific pollution (e.g., nutrient) reduction targets and policies more closely linked with the Black Sea Program. The PRP process is also striving to encourage more stakeholder involvement, especially from NGOs, projects that will attract environmental investment in the Danube countries, and increased public awareness (REC, 1997a and Weston, 1998b).

**Grants and Applied Research**

The Danube Grants Program was established in 1995, providing individual grants amounting to $4,000 and up to $25,000 per country. A total of 95 individual grants were awarded in 1995 (Atkinson, 1998). These grants are implemented through the regional environmental center or UNDP offices in Romania, Moldova, and Ukraine (EPDRB, 1996). Several recommendations offered during a kickoff workshop for the pollution reduction program (PRP) were to strengthen the Danube Program's small grants program by streamlining the award process, increasing the maximum award per country to $30,000 and better publicizing the results of the research (Weston, 1998b.).

An applied research program (ARP) was established as a PHARE funded initiative in mid-1995. It comprises some 14 projects implemented by a consortium of 15 European research institutes (EPDRB, 1997). The projects were developed to focus on the more complicated environmental questions and to intensify cooperation between Western and CEE research institutes. A majority of the research projects are complete. The program has provided valuable information on causes of environmental degradation and strategies for

improvement. One of the more notable ARP project results was development of the Danube Water Quality Model.

**Water Quality Modeling**

The Danube Water Quality Model (DWQM) is based on the general mass transport balance river model DELWAQ (REC, 1997a). The model breaks the Danube River into 40 segments. Each tributary and major "hot spot" is treated as a point source for purposes of this model. The DWQM is viewed as an important element in conducting the required trans-boundary analysis to determine the impact of the Danube on the Black Sea (EPDRB, 1998b), a key objective of the Danube Pollution Reduction Program. Early results confirm that large reductions in nutrient levels in the Danube will likely be required to significantly reduce eutrophication in the Black Sea coastal areas (REC, 1997a). The application of the model, however, is reportedly limited to large areas because of the available data (Weston, 1998b).

The United States Agency for International Development (USAID) had earlier sponsored development of a PC-based Danube Emissions Management Decision Support System (DEMDESS) that integrated computerized data and a modeling tool. The system was developed to support selection of cost-effective investments in wastewater treatment plants on four tributaries in Hungary, Romania, Slovakia, and Bulgaria (Bondelid, 1997). The usefulness of the DEMDESS software was based on the quantity and quality of laboratory and monitoring data. Problems with the transfer of information among ministries and institutes was not uncommon. The interest, and institutional structure and capacity of the participating nations suggested successful implementation of DEMDESS (Water and Sanitation for Health Project (WASH), 1992).

**Monitoring and Information Management**

The need to collect accurate and consistent monitoring data and information on the environmental state of the Danube and to share that information in a readily accessible and understandable format with government decision makers and the public continue to be priority issues. Early in the organization of the Danube Program, expert sub-groups on monitoring, laboratory, and information management (MLIM) and data management were established (EPDRB, 1996).

A basin-wide network of monitoring stations has been created and national laboratories and information centers strengthened. Concerns have been raised that there remains major geographical gaps and a wide disparity in the quality and reliability of data that will hamper water quality modeling efforts using the DWQM (Weston, 1998b). Inconsistency and incompatibility in data, especially prior to 1995, also remain of significant concern. The observed anomalies are believed due to an underestimation in non-point source pollution.

A Danube Information System (DANIS), accessible on the Internet since late 1995, has been established to enable the exchange of information relevant to environmental management, such as reports, publications, literature, and expert points of contacts. The system was developed to provide access to relevant primary information and databases to support the Danube Program PCU, Country Program Coordinators, the public, NGOs, and other interested parties (EPDRB, 1996). However, DANIS is viewed as suffering from outdated data, a lack of regular updating, and a lack of financial support to adequately maintain the information system (Weston, 1998b).

A Danube River Basin Information System Workshop was held in March 1998 in Baden, Austria with its main goal to assist the ICPDR in developing a comprehensive Danube Information Network (DPCU,

1998). Participants from 13 Danubian countries attended. One of the major achievements of the workshop was an assessment of existing information sources and systems having relevance to the Danube River Basin. The final report provided a summary of each of the system's strengths and weaknesses, operational costs, response to information needs of the users, and recommended measures to be taken.

One of the systems evaluated was the Danube Basin Information Network (DBIN). This system was suggested during a NATO sponsored workshop in May 1996 (Murphy, 1997b). Initial funding was subsequently provided by NATO's Scientific and Environmental Affairs Division as a means of improving access to information and data about environmental conditions in the basin and related institutions and activities. This was a collaborative effort among the Central European University and the VITUKI Water Research Institute in Budapest, the University of Ljubljana, and Colorado State University. DBIN is believed user-friendly with strong links to national web sites, however, was found to suffer from insufficient data and a lack of funding (DPCU, 1998).

The final Danube Information Network must serve as a viable management and decision support tool for the ICPDR that is also supportive of the work of the PMTF, the ICPDR expert groups, and donor organizations (DPCU, 1998). It is also important that the system be readily accessible by interested parties, to ensure continued public support for the program. The Information Network will likely be distributed, with a central ICPRD web site created and linked to other web sites and information systems. It was also recommended that the position of information system manager be established within the ICPRD.

**Accident Emergency Warning System**

A Danube Accident Emergency Warning System (AEWS) was formally placed into service in 1996, financed by the PHARE program. The system is being commissioned in steps over a period of several years. Its development was based to a large extent on lessons drawn from the Rhine Alarm System. Oversight was provided by a sub-group of experts from the riparian countries, with contracted support, and the assistance of the Danube PCU.

AEWS principal aims are to communicate immediate information about sudden changes in water quality and levels across the entire Danube Basin, thus protecting drinking water resources and assisting with flood control activities and ice hazards (Pinter, 1996). It was also developed to be fully compliant with existing international bilateral and multilateral agreements, and with Article 16 of the Danube River Protection Convention (DRPC, 1994).

When fully operational, a satellite-based communications network will be established to ensure reliable means of information exchange between each of the existing national principal international alert centers (PIACs). A PIAC is sited in each of the eleven riparian countries, with two located in the Ukraine. Assessment and decision units also provide necessary support to the PIAC in the case of an actual incident. Given the current political situation a territorial gap (e.g., the former Yugoslavia) exists in the system. The AEWS has been designed to easily incorporate this remaining area in the future (Pinter, 1996).

## 6.5 Regional Institutions and Initiatives

There are a number of interlocking economic, environmental, and military institutions contributing to improved environmental security within the Danube River Basin. A listing summarizing the more important institutions and their membership is provided in Table 6.3 (P. 94-96). This section addresses the organizational

## Table 6.3 - 1998 Interlocking Regional Institutions and Organizations

| | Membership of Listed Institutions and Organizations | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Country | Danube Task Force EPDRB | Black Sea Program | SECI | OSCE | PfP | EAPC | OECD | EBRD | NATO) | EU | WEU |
| Austria (b)(d) | x | | | x | x | | x | x | | x | x |
| Germany | x | | | x | x | x | x | x | x | x | x |
| Hungary (c) | x | | x | x | x | x | x | x | x(f) | | x |
| Czech Republic (c) | x | | | x | x | x | x | x | x(f) | | x |
| Slovak Republic (c) | x | | | x | x | x | | x | | | x |
| Slovenia (c)(d) | x | | x | x | x | x | | x | | | x |
| Croatia | x | | x | x | | | | x | | | |
| Bosnia-Herzegovinia | x | | x | x | | | | x | | | |
| Former Yugoslovia (e) | | | | x | | | | | | | |
| Albania | | | x | x | x | x | | x | | | |
| Bulgaria (c) | x | x | x | x | x | x | | x | | | x |
| Romania (c) | x | x | x | x | x | x | | x | | | x |
| Ukraine | x | x | | x | x | x | | x | | | |
| Poland (c) | | | | x | x | x | | x | x(f) | | x |
| Moldova | x | | x | x | x | x | | x | | | |
| Switzerland | | | | x | | | x | x | | | |
| Italy | | | | x | x | x | x | x | x | x | x |
| United States | x | | | x | x | x | x | x | x | | |
| Russian Federation | | x | | x | x | x | | x | | | |
| Turkey (a) | | x | x | x | x | x | x | x | x | | x |
| Georgia | | x | | x | x | x | | x | | | |
| Greece | | | x | x | x | x | x | x | x | x | x |
| Macedonia | | | x | x | | | | | | | |
| Denmark (b) | | | | x | x | x | x | x | x | x | x |
| Belgium | | | | x | x | x | x | x | x | x | x |

Notes a to e WEU Operational Development, Messervy-Whiting, 1997, JFQ 15 70-74, adapted with permission from Joint Forces Quarterly (JFQ)

a WEU Associate Member
b WEU Observer
c WEU Associate Partner
d EAPC Observer
e Suspended Member
f NATO Membership Expected in early 1999

## Table 6.3 - 1998 Interlocking Regional Institutions and Organizations (cont'd)

| | Membership of Listed Institutions and Organizations | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Country | Danube Task Force EPDRB | Black Sea Program | SECI | OSCE | PfP | EAPC | OECD | EBRD | NATO | EU | WEU |
| Norway (a) | | | | x | x | x | x | x | x | | x |
| Netherlands | | | | x | x | x | x | x | x | x | x |
| Spain | | | | x | x | x | x | x | x | x | x |
| France | | | | x | x | x | x | x | x | x | x |
| Estonia (c) | | | | x | x | x | | x | | | x |
| Latvia (c) | | | | x | x | x | | x | | | x |
| Lithuania (c) | | | | x | x | x | | x | | | x |
| Finland (b)(d) | | | | x | x | | x | x | | x | x |
| Cyprus | | | | x | | | | x | | | |
| Holy See | | | | x | | | | | | | |
| Sweden (b)(d) | | | | x | x | | x | x | | x | |
| Luxembourg | | | | x | x | x | | | x | x | x |
| Portugal | | | | x | x | x | x | x | x | x | x |
| United Kingdom | | | | x | x | x | x | x | x | x | x |
| Iceland (a) | | | | x | x | x | x | x | x | | x |
| Liechtenstein | | | | x | | | | x | | | |
| Monaco | | | | x | | | | x | | | |
| San Marino | | | | x | | | | | | | |
| Canada | | | | x | x | x | x | x | x | | |
| Malta | | | | x | x | | | x | | | |
| Ireland (b) | | | | x | | | x | x | | x | x |
| Armenia | | | | x | x | x | | x | | | |
| Azerbaijan | | | | x | x | x | | x | | | |

Notes a to e WEU Operational Development, Messervy-Whiting, 1997, JFQ 15 70-74, adapted with permission from Joint Forces Quarterly (JFQ)

a WEU Associate Member
b WEU Observer
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d EAPC Observer
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f NATO Membership Expected in early 1999

## Table 6.3 - 1998 Interlocking Regional Institutions and Organizations (cont'd)

| | Membership of Listed Institutions and Organizations | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Country | Danube Task Force EPDRB | Black Sea Program | SECI | OSCE | PfP | EAPC | OECD | EBRD | NATO | EU | WEU |
| Belarus | | | | x | x | x | | x | | | |
| Kazakhstan | | | | x | x | x | | x | | | |
| Kyrgystan | | | | x | x | x | | x | | | |
| Turkmenistan | | | | x | x | x | | x | | | |
| Uzbekistan | | | | x | x | x | | x | | | |
| Tajikistan | | | | x | | | | x | | | |
| Australia | | | | | | | | x | | | |
| Japan | | | | | | | | x | | | |
| Israel | | | | | | | | x | | | |
| Korea | | | | | | | | x | | | |
| Mexico | | | | | | | | x | | | |
| Morocco | | | | | | | | x | | | |
| New Zealand | | | | | | | | x | | | |
| European Community | | | | | | | | x | | | |
| Eur. Investment Bank | | | | | | | | x | | | |

structure and relative contributions that each has made in addressing the major environmental security issues identified earlier.

**North Atlantic Treaty Organization (NATO)**

The North Atlantic Treaty Organization (NATO) alliance was formed in 1949 to maintain the security of Western Europe following the fall of the Central Europe to the Soviet Union. NATO member states numbered 16 in 1998 (Table 6.3). For some forty years NATO's primary purpose was thwarting any potential hostile or aggressive action on the part of the Warsaw Pact, an alliance of the Soviet Union and CEE countries, not including the former Yugoslavia. With the collapse of the Soviet Union and Warsaw Pact in the early 1990s, NATO underwent a massive reduction in force, yet remains the world's most capable military organization (Binnendijk, 1997), with an untainted record as a defensive alliance.

NATO is also looking at fostering stability and security in the CEE region by expanding its membership. In 1997, NATO invited the Czech Republic, Poland, and Hungary, all former Warsaw Pact members, to become members of the alliance. Other CEE and Baltic countries are also very interested in membership, but the political climate in the United States, the associated costs to the alliance, and Russian fears have delayed further expansion. Expansion is costly, estimated at some $30 billion over the next 12 years. Qualifying for NATO membership also requires a solid demonstration of democratization, interoperability of forces, and civilian control of the military (Binnedijk, 1997).

Military expenditures, as a percentage of GDP, has fallen significantly worldwide from a level of approximately 4 percent in 1990 to 2.4 percent in 1995, which has been attributed to the dissolution of the Soviet Union and Warsaw Pact, increased democratization and a change in political climate (World Bank, 1997). There is ongoing debate as to whether falling military spending has had a resulting "global peace dividend" in speeding economic development. Reportedly, in peacetime, the relationship between lower military spending and economic growth is not significant for developing countries. Rather, economic growth is most likely more a reflection of investor confidence in the relative stability of a particular nation than in some particular level of defense spending. Thus, the level of spending will vary by nation.

European Union countries have also been spending a smaller share of GDP on defense, while expending more monies for public order and safety (Eurostat, 1998). Germany's defense budget, for example, has dropped from 2.84 percent of GDP in 1985 to 1.41 percent in 1995. A partial comparison of defense manning and expenditures for Danubian nations was provided in Table 5.3. Overall, military expenditures for Western Europe have declined gradually from $232 billion in 1987 to $193 billion in 1995 (Renner, 1998). By comparison, Eastern Europe has experienced a dramatic decline in defense spending from $247 billion to $21 billion from 1985 to 1995. There is concern over the impact that lower defense spending may have on those CEE militaries aspiring NATO membership (Pomfret, 1995).

NATO formally established a Committee on the Challenges of Modern Society (CCMS) in 1969 to give the Alliance a new social dimension with an aim to focus and combine expertise and technology to address practical problems already under study at the national level for the benefit of all alliance members. The CCMS currently operates under the auspices of NATO's Assistant Secretary General for Scientific and Environmental Affairs. The Executive Committee of the CCMS meets twice annually to advance environment and security objectives within NATO, the Euro-Atlantic Partnership Council (EAPC), and Partnership for Peace (PfP) nations (NATO, 1998a). Since 1992, PfP countries have been allowed to participate in CCMS activities. United States participation includes the Department of Defense, Department of Energy, and Environmental Protection Agency.

The NATO CCMS is actively involved in a number of environmental pilot studies of two- to five-year duration. One pilot study on the reuse of former military lands addresses the environmental cleanup of former military installations in the aftermath of Soviet occupation of CEE and FSU countries. Later phases of this pilot study have focused on actual reuses of military sites in the Danubian countries of the Czech Republic and Poland.

The committee has also been actively involved in a project to enhance environmental security in the Black Sea through regional cooperation (Goodman, 1997). This effort was led by the United States and Turkey and included participation by other regional states. This short-term project officially began in July 1996, with the objective of contributing to regional economic and environmental well being and stability (NATO, 1998c). A primary product was a science plan that recommended a ten-year research and technological effort that, reportedly, will provide a necessary scientific basis to the Black Sea Strategic Action Plan, and will lead to development of a Black Sea Observation and Forecasting System.

NATO's initial funding of a Danube Basin Information Network (DBIN) was discussed earlier in this chapter. This initiative involved the cooperative effort among four universities and institutes. NATO also funded an earlier workshop of the Danube countries to address transboundary monitoring.

**Partnership for Peace (PfP)**

In order to help maintain a cooperative military relationship and to promote democratic principles with the Russian Federation, nations of the FSU, and CEE countries, NATO established the Partnership for Peace (PfP) program, a U.S. initiative, launched during the Brussels Summit in January 1994. Approximately 27 partners currently participate in the PfP program (Table 6.3). All partners have submitted initial documentation setting forth commitments to resource PfP activities and to meet PfP political goals (DoD, 1998b). This program is viewed by NATO as a critical element in a continent-wide security architecture inclusive of the Russian Federation (USEUCOM, 1998a).

Among the key tenets of the PfP framework document are "ensuring democratic control of defense forces, maintenance of the capability and readiness to contribute forces...to the United Nations or the Organization for Security and Cooperation in Europe (OSCE), development of cooperative military relations with NATO, for the purpose of join planning, training, and exercise" ... so as to strengthen their ability to undertake missions in ...both "peacekeeping"...and "humanitarian operations" (DoD, 1998b). Theory was put to the test with the deployment of the NATO-led peacekeeping implementation force (IFOR) to Balkans (Joulwan, 1997). Danubian PfP nations that are involved include Albania, Austria, Bulgaria, Czech Republic, Hungary, Poland, Slovenia, and Ukraine (DoD, 1998b).

**Euro-Atlantic Partnership Council**

The Euro-Atlantic Partnership Council (EAPC) was recently established by both NATO and PfP partners as a framework for expanding the political dimension of the existing PfP program. The EAPC replaces the North Atlantic Cooperation Council (NACC), established in 1991, and comprises the 16 NATO members and nations of the CEE and FSU. Former NACC members and PfP participants were given automatic membership in the EAPC. Membership is shown in Table 6.3. The Council provides a new forum for discussions on a broad range of both political and security issues, encouraging increased and transparent cooperation, consultation, and political discourse between individual partners and NATO allies committees (DoD, 1998b).

The NATO CCMS and the EAPC recently sponsored a workshop on military activities and the environment attended by 150 participants from 29 countries (NATO, 1998b). The workshop had several goals:

- to enhance awareness and acceptance for the CCMS-sponsored handbook "Environmental Guidelines for the Military Sector;"
- to share results from ongoing efforts of the CCMS pilot studies, to increase the relationship between militaries and global climate change, and;
- to develop an EAPC defense environmental Model Work Program to provide a foundation for future environmental cooperation.

**Organization on Security and Cooperation in Europe**

The OSCE (formerly the Conference on Security and Cooperation in Europe) comprises a community of some 55 European nations and Canada (Table 6.3). It was declared a regional arrangement of the United Nations at the 1992 Helsinki Summit and, as such, provides a unique forum for uniting all European nations and the United States in addressing fundamental human rights and in preventing regional conflict. The OSCE is not a collective defensive alliance and does not maintain military resources. Rather, it maintains a strong link with NATO, the Alliance having agreed to provide support to OSCE peacekeeping operations and inviting OSCE members to participate in PfP.

**European Security and Defense Identity**

European Union (EU) member states have successfully pooled their respective sovereign powers to ensure economic unity. However, it is unlikely that these same nations will be as willing to surrender their national sovereignty in defense for some time to come (Barry, 1997). As the NATO alliance expands in the next century, it will likely become more European, with allies wanting more of a leadership and decision role. A European Security and Defense Identity (ESDI) has been established within NATO over the last decade. To many this concept remains a perplexing concept, especially given many European nations' reluctance to give up their national militaries.

A Western European Union (WEU) has also been revived as a means of completing Europe's integration (Barry, 1997). The WEU currently has ten members who are also full members of the European Union (EU) and NATO. In addition, 18 nations have an associate or observer status (Table 6.3). With the exception of a planning cell, the WEU does not have permanent military structures (Messervy-Whiting, 1997). Rather, military assets are assigned on a case-by-case basis, as appropriate to a particular operation. The WEU participated with the EU in the arms embargo on the Danube River (Barry, 1997). Challenges to this alliance include its relationship with the EU, declining defense budgets, and how to address the nuclear weapons of some members.

**The European Union**

The European Union (EU) has evolved over 40 years to become one of world's largest economic and trading powers, and a major player on the world scene today. Created after World War II, and known by several names, its intent throughout has been to unite European nations economically in an effort to preclude another such devastating conflict on the continent. Membership grew from six to 15 nations (Table 6.3) since the first treaty was signed. Its combined GDP exceeds that of the United States (EU, 1996b).

The EU is governed by five institutions to include the Commission, Council of Ministers, Parliament, Court of Justice, and Court of Auditors. The Commission, comprised of 20 commissioners acting independently on behalf of EU interests, "proposes" legislation and is responsible for administration and implementation of EU treaties and decisions. The Commission's administrative staff numbers some 15,000 and is located in Brussels.

The Parliament totals 626 members representing political not national groups. Parliament members are elected for five-year terms in EU-wide elections, while a president is elected for 2.5 years. Parliament does not enact laws, rather it can approve, amend or reject those proposed by the Commission and submitted through the Council. The Council of the European Union is comprised of ministers from each of the member states, its main purpose is to enacts EU laws from proposals provided from the Commission. The presidency of the Council is rotated among the ministers every six months (EU, 1996c).

Built on international treaties, versus a constitution, EU unity entails a pooling of sovereign powers. Members, however, have retained sovereignty in the areas of national security and defense (EU, 1996c). The Maasstrich Treaty of 1992 also cleared the way for the completion of economic and monetary union and the introduction of a single currency.

Understandably, many Danubian countries are actively aspiring for full EU membership. In 1994, the EU adopted a "pre-accession strategy" to intensify efforts to assist CEE countries toward full EU membership. This strategy builds on existing agreements with ten CEE countries to improve market access to the EU, and allowed PHARE, its grants program to support political and economic reform in CEE, to contribute more funding to support investment projects. A 1995 white paper outlined requirements for bringing laws, standards, and product certifications into conformance with those of the Union (EU, 1996c).

The European Commission recently presented "Agenda 2000" to the European Parliament to strengthen the pre-accession strategy, including the pre-accession strategy for the environment (REC, 1997c). The Commission also prepared a guide to help aspiring countries achieve compliance with EU environmental legislation (EU, 1997b). As discussed earlier, the majority of EU environmental legislation is in the form of directives, requiring member states to implement via respective national laws. Public polls reflect a majority (66 percent) of support for a strong EU decision-making role over that of national governments as concerns the environment, primarily because of transboundary concerns (EU, 1996d).

An important supporting body to the EU is the European Environmental Agency (EEA). Established in 1990, and located in Copenhagen, its membership is also open to non-EU countries that share its concern for the environment. The Agency has established cooperative relationships with other international environmental organizations and NGOs to leverage its resources and to avoid duplication of effort. It regularly publishes environmental reports and newsletters. The Agency was also responsible for both the first and second assessments of the state and progress of "Europe's Environment" (EEA, 1995 and 1998).

Eurostat is the statistical office of the EU located in Luxembourg. It collects and analyses European macro-economic and social data to support member states and other EU agencies and organizations in their operations. More recently, it has been tracking over forty indicators of sustainable development (Eurostat, 1997b). Eurostat's issues regular news releases and briefs on a number of the most commonly requested topics, including unemployment, inflation, pollutant emissions, expenditure by industrial sector, life-expectancy and other regional demographics.

**Organization for Economic Co-operation and Development**

The Organization for Economic Co-operation and Development (OECD) was established in 1961 as a replacement for its predecessor Organization for European Economic Co-operation (OEEC), created to administer U.S. aid under the Marshall Plan in the rebuilding of war-ravaged European economies after War II (OECD, 1998b). The OECD comprises 29 nations (Table 6.3), to include the United States Japan, Canada, New Zealand, and Mexico. The Slovak Republic is currently negotiating accession.

Article 1 of the Convention establishing the OECD requires the Organization to promote policies that achieve the highest sustainable economic growth and employment and expansion in world trade for its member countries, while complying with international obligations and contributing to the development of the world economy (OECD, 1998b). Headquartered in Paris, it acts as a forum for intergovernmental exchange of ideas and cooperation committing each member to the basic principles of democratization and market economy. The OECD is actively involved with non-members from the CEE region.

The Organization established a Center for Co-operation with Non-Members (CCNM) in 1998 to promote cooperation with non-member economies. A number of non-member countries also participate in OECD activities as observers or full participants. As discussed above, the OECD also serves as the Secretariat for the EAP Task Force.

The Organization regularly collects and analyses socio-economic and environmental data across its member countries and produces a number of reports and publications. The OECD Group on the State of the Environment (SOE) recently published a report entitled "Towards Sustainable Development - Environmental Indicators" which presents both socio-economic and environmental data on member nations (OECD, 1998c). This report is based largely on an OECD environmental database for 1997. The CCNM has also published a number of reports focused on non-members.

The Nuclear Energy Agency (NEA) was established in 1958 as a semi-autonomous body within OECD, comprising all 29 OECD member countries except New Zealand and Poland. NEA's primary objective is to promote cooperation among members in the development of nuclear power as a "safe, environmentally acceptable and economic energy source" (NEA, 1997). The agency works with the European Commission and, via a cooperative agreement, collaborates with the International Atomic Energy Agency in Vienna.

The NEA has also been active in assisting CEE nations in the areas of nuclear safety and regulation. CEE nuclear experts are regularly invited to NEA technical workshops and specialist meetings. The agency has also been active in conducting a series of regional nuclear emergency exercises in a member "accident host" country, with bordering countries participating simultaneously. A total of thirty countries participated in a 1996 exercise, hosted by Switzerland, to include several Danubian countries (Bulgaria, Romania, Slovakia, and Slovenia). A similar exercise is planned for Hungary in late 1998 (NEA, 1997).

**Southeast European Cooperative Initiative**

Given the continued volatile nature of Southeast Europe, the United States and European Union (EU) launched the Southeast European Cooperative Initiative (SECI) in 1996. It encourages regional economic and environmental cooperation, and facilitates integration of aspiring members into both the EU and NATO, while continuing to provide support to those nations less likely to join (SECI, 1998a). Membership is shown in Table 6.3.

SECI is envisioned as a self-help program to complement other regional cooperative initiatives, avoiding any needless new bureaucracy. Coordination of the initiative is through a high-level personality (HLP), named by the Organization on Security and Cooperation in Europe (OSCE). SECI, however, is not an official arm of the OSCE. Austria, Italy, Switzerland, and the United States provide the necessary funding to support the HLP and a small support staff of three. The SECI office is currently located in Vienna.

SECI will employ working groups to identify priority projects to address major economic and environmental problems of concern to more than one member, and will work closely cooperate with the (ECE) for technical expertise. It is hoped that these projects will attract private investment as well as international financial institutions, the EU and the United States (SECI, 1998a). Of the eight existing projects, those having the potential to directly impact the overall environmental security of the Danube River Basin include: "Interconnection of Natural Gas Networks, Diversification, and Security of Supply" (SECI, 1997a), "Identification of Transport Bottlenecks along Main International Corridors" (SECI, 1998b), and "Recovery of Rivers, Lakes and the Black Sea" (SECI, 1997b).

An initial meeting of the Project on "Recovery of River, Lakes and the Black Sea" was convened by the SECI coordinator in Austria in December 1997. This forum was seen as providing an umbrella for the more efficient coordination of a number of ongoing initiatives, including transport, related to the "Danube Recovery Programme" (DRP), as the assembled project group was subsequently termed (SECI, 1997b). SECI participating countries included Bulgaria, Croatia, Hungary, Macedonia, Moldova, Romania, and Slovenia. Representatives from Germany, Austria, the Environmental Programme for the Danube River Basin, OSCE, UN, World Bank and an observer from an NGO of the former Yugoslavia were also in attendance. The Black Sea Environmental Program indicated a willingness to actively participate in the DRP.

Key findings of this first meeting were that "Danube-related activities seem to be over-programmed and under-financed," that what was needed is a transitioning from planning to action focused on fundable projects (SECI, 1997b). It was stated that Danube initiatives are not being marketed well, and thus lack needed "political commitment for funding". It was also noted that there will be a growing demand for more specialized information on the state of the Danube, which prompted a recommendation for coordinating linkages among the existing Danube data systems, while avoiding the costly development of any new and unwarranted systems. A major conclusion reached was to involve the ministries of finance from the participating SECI countries to sit as permanent members of the DRP Project Group, and to host a high-level meeting with the finance ministers and international finance institutions to provide increased visibility and support for key Danube initiatives.

The Project was subsequently renamed "Recovery of River, Lakes and Adjacent Seas" (formerly "Recovery of River, Lakes and Black Sea"). SECI remains a dynamic and evolving initiative. Likewise, the focus of the DRP Project Group is also changing. Reportedly, its primary focus will be on improvements to wastewater and drinking water treatment systems within the Danube River Basin.

**European Bank for Reconstruction and Development**

The European Bank for Reconstruction and Development (EBRD) was established in 1991 to foster the transition from centrally-planned to market-based economies and private enterprise in those countries of CEE and the CIS, who demonstrate continued commitment to the fundamental principals of democratization and free enterprise. This will require implementation of significant structural and economic reforms, liberalization of financial and trade markets, privatization, and increased entrepreneurship and competition. EBRD's strategies for each country and its projects support enlargement of the EU (EBRD, 1998b).

EBRD membership totals 58 countries, to include 26 countries from CEE and the CIS, the United States, Japan, the European community, and the European Investment Bank (Table 6.3). Power of the bank is vested in a 23-member Board of Governors. Each of the 60 members has voting power. The Board of Governors has delegated many of its powers to a board of directors, which is responsible for general operations, policy making, and loan approvals, and elects a president to chair the Board of Directors for a four-year term (EBRD, 1998c). The United States, being the greatest contributor to both the World Bank and EBRD, has considerable influence.

The EBRD maintains flexibility in its operations by being able to operate in both the private and public sectors. Further, it can tailor financial instruments, such as loans, equity investments, and guarantees, to specific projects. Since its inception, the Bank has approved 574 projects, committing ECU 11.2 billion of EBRD funds and potentially an additional ECU 31.2 billion of non-EBRD monies. Reportedly, two thirds of EBRD funding went for private sector projects (EBRD, 1998b). The largest recipients of EBRD financing for 1997 were (in order) the Russian Federation, Romania, Hungary, and Poland (EBRD, 1998b).

The EBRD is the first international financial institution to have been given a mandate by its founders in the agreement establishing the Bank specifically requiring it to "promote in the full range of its activities environmentally sound and sustainable development" (ERBD, 1996b). This mandate is reinforced in the both EBRD's environmental policy and procedures. The latter document, provides specific procedures for conducting an environmental appraisal of all EBRD investment and technical cooperation activities, in addition to economic, legal, and other technical reviews (EBRD, 1996c).

The EBRD also promotes the dissemination of information about the environmental aspects of its projects. One means is through the biennial publication of an environmental bulletin entitled "Environments in Transition" which is printed in both English and Russian. Additionally, EBRD prepares and updates individual Information Sheets on specific countries or projects and allows on-line access to the Bank's environmental activities.

The EBRD's activities within the Danube River Basin have attempted to address projects focused on the hot spots presented in the Strategic Action Plan (EPDRB, 1995). This has required several investment approaches, to include direct investments in environmental projects with municipalities or local utilities, or through a multi-project framework, when the small size of investments would not make individual projects attractive to the Bank.

The EBRD is also investing in projects addressing the link between the inefficient use of energy and the adverse impact it can have on the environment. In 1997 alone, the Bank committed ECU 88 million of its fund directed toward projects in the energy efficiency sector having a total investment of some ECU 295 million (EBRD, 1998b). One example is the EBRD financing totaling some ECU 40.8 to improve the district heating systems for five Romanian cities, significantly reducing energy losses in the existing networks.

The EBRD also administers a Nuclear Safety Account (NSA), established in 1993 at the bequest of the G-7 heads of state and government. The account invites international community contributions to be used for grants for nuclear safety projects in the region, thus enabling the countries operating Soviet-designed reactors to bridge the "gap" between their current level of operation to international safety standards. Priority is given the higher risk reactors and to national electrical demand needs. The EBRD is supporting upgrades to reactors 1-4 at the Kozloduy nuclear power plant in Bulgaria, at a cost of ECU 24 million. Cumulative pledges to the NSA through 1997 total ECU 260.6 million (EBRD, 1998b).

**Non-Governmental Organizations**

Non-Governmental Organizations (NGOs) are important key actors within the Danubian region. The role of NGOs as catalysts of change was previously illustrated by events in Hungary and Czechoslovakia (see Case Study 2) in the late 1980s and, thus, should not be underestimated by policymakers. Over the last decade there has been an exponential growth in environmental interest groups in the CEE region, with some estimates placing the number at 1,800 (REC, 94).

The participation of both national and regional NGOs has provided a broad range of viewpoints and valuable expertise to the Environmental Programme for the Danube River Basin (EPDRB, 1996). The contributions being made by the international World Wide Fund for Nature (WWFN) as part of its "Green Danube Programme" in helping to restore several valuable alluvial ecosystems along the mainstem of the Danube and its delta was previously outlined. The growing networks of NGOs are helping to better channel information between national governments and the general public.

A Regional Environmental Center (REC) for Central and Eastern Europe was established in 1990 by Hungary, the United States, and the European Commission as an independent, non-profit, international foundation to promote cooperation among diverse interest groups in solving regional environmental problems (REC, 1997b). A charter signed by some twenty-five governments and the European Commission currently provides a legal basis for the Center's operation. The REC has its headquarters in Szentendre, Hungary on the culturally significant "Danube Bend." The Center also maintains local offices in 15 CEE countries. Its annual budget is approximately $5.3 million (REC, 1997b). The United States remains a "donor," along with other Western European and CEE countries, Japan, and the European Commission.

The REC assists NGOs, governments, businesses, and other stakeholders in several priority areas. Specifically, these include information exchange to facilitate networking and public access to environmental information, grants to environmental NGOs, capacity building through fellowships, internships, and training, and through its emphasis on special initiatives, such as strengthening the negotiating positions of those countries desirous of European Union accession. The Center provides information services and linkages through their own Internet site. The REC library is available for public use and is linked to the Danube Information System (DPCU, 1998).

The REC has also been active in enhancing NGO participation in the UNDP/GEF Danube Pollution Reduction Program. In cooperation with the Environmental Programme for the Danube River Basin Coordination Unit (PCU), the REC has facilitated a series of regional and national meetings in some eleven Danubian nations (REC, 1998). The REC also administers the UNDP/GEF's Danube Small Grants Program (Georgieva, 1998).

The Environmental Programme for the Danube River Basin Coordinating Unit (PCU) is also actively pursuing establishment of additional information centers to be run by NGOs in the upper and lower reaches of the Danube River (EPDRB, 1996). It is envisioned that such centers would stimulate more public participation and develop the requisite network needed to attract projects and grants. The "Danube Watch", first released in 1994, is the widely circulated magazine of the Environmental Programme for the Danube River Basin. Published in Vienna with funding from UNDP/GEF, articles are freely submitted by various government agencies, NGOs, and other interested stakeholders, not necessarily reflecting the views or an official position of the Danube Task Force or PCU.

## 6.6 United States Involvement

In order to intensify U.S. environmental efforts abroad, former Secretary of State Christopher announced the establishment of regional environmental hubs in key embassies worldwide to advance U.S. national environmental interests, focusing on priority environmental problems specific to a particular region and best worked through transboundary cooperation. The hubs are to be established to direct the efforts of other U.S. government agencies operating overseas. A total of twelve regional hubs are to be opened (State Department, 1997). No new hub is to sited in CEE, since the existing Regional Environmental Center (REC) in Budapest, established in part by the U.S., currently provides a similar role in coordinating the activities of NGOs and national government agencies.

United States efforts in CEE have focused on environmental problems inherited from the Soviet era, specifically air and water pollution from inefficient industrial and energy processes and nuclear safety. Air quality in CEE has been severely degraded because of the reliance on coal-fired plants. The United States has provided technical expertise and promoted the use of clean technologies (State Department, 1997). Additionally, on nuclear safety, the U.S. has been working to improve the safety of Soviet-designed nuclear reactors in several countries, and with the Ukraine to close the Chernobyl nuclear power plant.

The DoE has conducted a comprehensive and cooperative effort entitled the "Soviet-Designed-Reactor Safety Program" with stated goals to strengthen both the operational and physical condition of these types of plants, to promote an enhanced safety culture among plant personnel, and to maintain high standards of performance for the supporting infrastructure (CES, 1998). Through 1996, a total of some $180 million had been expended on 150 projects. DoE's emphasis has been on operational safety, believing that well trained operators can deal with less than optimum hardware, while the reverse is not necessarily true.

In a special congressional appropriation to USAID, over $1.5 billion was obligated from 1989 to 1992 under the Support for Eastern Europe Democracy (SEED) program (Murphy, 1997a). These funds, approximately half going to Poland, were established to assist in the development of market-based economies, democratization, and improved quality of life.

In the early 1990s, USAID funding led to contracted development of a "Danube Emissions Management Decision Support System (DEMDESS) and to several studies dealing with point source pollution in the Danube Basin" (EPDRB, 1995). The DEMDESS was implemented in four tributary watersheds, assisting Hungary, Slovakia, Bulgaria, and Romania in their evaluation of alternative waste water treatment approaches and technologies (Bondelid, 1997).

In 1995, the USAID also developed a three-year GEF project in three different Danube tributary basins (e.g., Hungary, Slovakia, and Romania) to reduce transboundary emissions of toxins and pathogens (EPDRB, 1996). The primary emphasis in each of the three basins is to accelerate technology transfer and the adoption of pollution prevention techniques. The project also allows for the purchase and installation of equipment to improve operation of both municipal and industrial waste treatment systems. Monitoring stations are also being established at applicable borders to provide an early warning of water quality degradation. This system is being integrated with the Danube AEWS, discussed earlier. Estimated costs are $8.5 million, with USAID providing $6.5 million, the remainder contributed by the host nations (Latif, 1998).

The USAID continues to play an active and crucial role in both the Danube and Black Sea Environmental Programs. NGOs also have worked closely with the USAID in advancing U.S. environmental policies overseas (Christopher, 1996).

The United States European Command (USEUCOM) is one of five U.S. geographic unified commands. A primary mission of the USEUCOM is to provide trained and ready military forces in support of the NATO alliance. The command's area of responsibility, however, extends beyond Europe to include major portions of Africa and the Middle East, a total of 89 countries and over a billion people. The Commander-in-Chief (CINC) of the U.S. European Command is also dual-hatted as the Supreme Allied Commander Europe (SACEUR). In the latest Strategy of Readiness and Engagement the CINC has restated the command's commitment to strengthen NATO, support NATO enlargement, and to enhance the PfP program (USEUCOM, 1998a).

The level of activity in EUCOM has increased dramatically since 1989. From 1946 to 1989 some 22 operations were conducted, the command's main mission primarily supporting NATO in the defense of Western Europe. Over the past five years, the number of operations has averaged some thirteen per year. These operations have been of varying scope and duration, from demining operations and non-combatant evacuation operations in Africa to peacekeeping operations in the Balkans (USEUCOM, 1998b.).

The USEUCOM is committed to promoting democratization and closer relationships with the nations of CEE, through continued support of its military-to-military bilateral and multilateral engagement programs and initiatives. It also provides support to the George C. Marshall Center for European Security Studies and NATO School, both located in southern Germany. The Marshall Center was founded in 1993 by the United States to provide instruction to senior defense officials in CEE and FSU countries in security studies which promote democratic principles, civilian control of the military, and market economies. The Marshall Center is operated by USEUCOM, with support of the German government.

USEUCOM hosts an annual environmental conference, recognized by senior leadership as its "flagship" environmental event. The conference targets high priority military environmental issues and participation from the ministries of defense and environment of PfP nations. The first series of conferences from 1993 to 1997 dealt with solving environmental issues impacting active military installations, and later the conversion and reuse of former military lands. The first of a series of working conferences designed to address the environmental aspects of military operations, exercises, and training was initiated in May 1998. The President of Hungary provided the keynote address at the 1998 Conference, underscoring the need for cooperative military environmental stewardship.

In February 1998, the United States also announced a Southeast Europe Action Plan to give further dynamism to ongoing U.S. cooperative efforts in the region, to assist with the integration of stable democracies into the European Union, and to reinforce stability in the Balkans (White House, 1998). This initiative is seen as promoting greater regional cooperation by expanding political, economic, military and civil cooperation with the nations of Southeast Europe and with other members of the European Union. The Action Plan was directed to incorporate the bilateral working group format successfully used by the U.S. Department of Defense (DoD) over the last several years. DoD Secretary Cohen had earlier stressed DoD's support to the region during a Southeastern European Defense Ministerial (SEDM) in Bulgaria in October 1997.

# 7. POLICY IMPLICATIONS

The previous chapters have reviewed the factors that have influenced socio-economic and cultural development within the Danube River Basin, and identified the major environmental security issues that are likely to have an impact on future regional stability. Also covered were a number of initiatives by international and regional institutions to assist the Danubian nations in addressing regional environmental security issues during a difficult period of social, economic, and political transition. The following summarizes the major conclusions of this paper and recommends areas for future policy consideration and emphasis:

*1. The Danube River Basin remains strategically important* to both Europe and the United States. This region has been a key objective for imperial aspirations over the centuries, the Danube serving as a natural artery for invading armies. The Danube inland waterway system now allows several landlocked nations access to both the North and Black Seas. European wars have typically begun as smaller conflicts that quickly escalated. The volatility of the Balkans, at the confluence of major fault lines, has been a catalyst for one major world war earlier this century, enveloping Europe and eventually the United States. American presence in Europe over the last five decades has supplied a necessary, yet costly deterrence. Western forces are now employed in a critical peacekeeping role in separating warring parties in the Danube region. The United States and Europe have become economically interdependent, with 40 percent of investments abroad (over $315 billion) and over 20 percent of U.S. exports going to Europe. These economic interests would be jeopardized by another major conflict on the European continent. Danubian nations also have the potential for attracting increased Western investment and trade, as they successfully transition to market based economies and become full members of regional economic and security institutions. Building stable markets in CEE is important to reinforcing the national security of the U.S.

*2. An ecogeographical cooperative approach is supportable* as a means of continuing to enhance environmental security in the Danube River Basin. An ecogeographical approach presents opportunities for Danubian nations to tackle common high priority transboundary environmental issues in a coordinated fashion. The Danube River has historically provided a cohesive influence, binding disparate cultures and peoples. This approach has been used successfully in other international and European riverine ecosystems, and for the Black Sea. Several distinct sub-regions have also been identified within the basin, based on geographical, cultural, and economic factors. Danubian nations and interested international institutions established an Environmental Programme for the Danube River as a means of ensuring sustainable development within the basin. Considerable effort has been expended on national and regional strategic planning to better coordinate activities in meeting a common objective, the restoration and protection of the Danube.

*3. Regional institution activities should be appropriately coordinated* to better leverage existing capabilities and assets, and to avoid duplication of effort. This paper has provided a detailed review of the major environmental security issues having the potential to impact regional stability and the initiatives being undertaken by both international and regional institutions in addressing these issues. These initiatives are becoming increasingly more numerous and seemingly duplicative. Nuclear safety activities in the region contribute heavily to overall regional security and stability, but involve no less than four major international and regional institutions. The lower reach of the Danube will also receive more focused economic and environmental cooperation as part of a Southeast European Cooperative Initiative (SECI). This program was created to complement other regional cooperative initiatives, while avoiding the creation of new bureaucracies. One of SECI's priority projects is viewed as an "umbrella" program entitled the "Danube Recovery Programme" with a stated purpose that appears not that dissimilar from several other existing organizations. It is important that such initiatives be appropriately coordinated through existing forums, such as the International Commission for the Pro-

tection of the Danube River and the Danube Commission, to take full advantage of existing study and planning efforts. Future regional initiatives should stress action and identify resourcing. However, no single organization has responsibility for addressing all of the major environmental security issues identified in this paper in a coordinated fashion.

*4. **Regional economic and security relationships remain dynamic***, as evidenced by ongoing NATO enlargement and European Union (EU) accession efforts. Initiatives have flourished since the end of the Cold War to assist with the economic transition of the Danubian nations. The "euro" becomes the single official currency of the European Union effective 1 January 1999, symbolizing a more integrated and competitive Europe. The EU is fast becoming an economic and trading powerhouse with increasing global importance, and remains an attractive alliance to nations within the Danube River Basin. It is likely that many of these countries, especially in the lower reaches of the Danube, will not be able to meet the more stringent economic criteria and environmental standards required for EU membership. The impact that a revived European security architecture (e.g., a re-energized Western European Union) might have on the long-term NATO alliance is at best puzzling. The impact that a re-emergence of a stronger Russian presence would have on the geopolitics and stability in the region, particularly in the Ukraine and lower Danube, is also not fully understood. Engagement activities should be promoted by Western institutions to help diffuse the current internal political and economic situation within the Russian Federation.

*5. **United States involvement should be continued and more focused*** to ensure resources and expertise are used in an efficient manner in addressing the major regional environmental security issue in the Danube River Basin. The United States has been active for the latter half of this century in establishing regional economic and military alliances in an effort to ensure the stability of Europe following World War II. Since the end of the Cold War, the U.S. has turned its attention on stabilizing the CEE region. The United States has unique assets and capabilities to offer. The State Department would seem to the logical candidate to provide the required leadership in developing an interagency strategy and approach in coordinating U.S. efforts directed at both the Danube River Basin and Black Sea regions. This effort should complement existing regional initiatives for these two vital and interdependent ecogeographical areas, but with an overall focus on the major regional environmental security issues identified in this paper. Communications should also be strengthened with the Environmental Programme for the Danube River Basin, the Black Sea Environmental Program, the European Union, and other regional institutions. The lower reach of the Danube requires particular attention, and recent efforts as part of the SECI should be supported, as long as they are not duplicative of other organizations' efforts.

*6. **Additional environmental data and decision support systems are needed*** to assist policy makers better understand the complex interaction of environmental, social, economic, and political variables that are associated with maintaining regional stability. Inconsistency and incompatibility in CEE data are hampering this effort. There are a number of information management systems currently operating to some degree. Recently, many of these systems were assessed with the goal of developing a comprehensive Danube information network. Water quality modeling tools have been successfully developed to evaluate the smaller watersheds of several Danube tributaries. While highly aggregated economic and social data have been commonly reported as a means of influencing public policy, similar environmental indicators remain a relatively new and often controversial area. The UN, OECD, and European Environmental Agency have been developing and compiling environmental indicators for Western Europe, and more recently for CEE. As baseline data and aggregated indicators become more readily available, they can be used in simulation models and decision support systems to assist environmental planners, scientists, and policy makers address the complex interaction of

underlying variables impacting regional stability, and to prioritize activities and target hot spots for specific attention. A more detailed discussion is provided at Appendices A and B. Further research in this area should be supported.

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# 9. APPENDICES

A - Metrics for Policy Formulation and Evaluation
B - Environmental Decision Support Systems
C - Group Exercises
D - Seasonal Pattern of Mean Monthly Discharges
E - Contribution of Tributaries' Flows
F - Biochemical Oxygen Demand (BoD)
G - National Action Plans (NAPs)
H - Interim Danube Program Organization
I - Permanent ICPDR Organization

# APPENDIX A

## METRICS FOR POLICY FORMULATION AND EVALUATION

Communicating policy decisions to the public and obtaining their support concerning often complex issues is vital. Indicators have been used to provide information in a quantifiable, yet simple, form that is easier than more complicated statistics or other scientific data. Unlike the more raw forms of primary data, indicators and more highly aggregated indices form the top of an information pyramid. To be successfully applied in policy formulation and later in policy evaluation, they must be user-driven, meaningful, policy-relevant, and contain highly-aggregated information (Hammond et. al, 1995). While an indicator may have many components derived from raw data, the final indices must be limited if they are to be successfully applied.

**Socio-Economic Indicators**

Highly aggregated economic and social indicators are commonly reported as a means of influencing public policy and are used extensively in monitoring national and regional development. The World Bank continues to monitor and annually publish priority world development and social indicators (World Bank, 1996 and 1997). The Organization for Economic Cooperation and Development also regularly tracks and annually publishes select socio-economic indicators by several major sectors (OECD, 1998b and 1998c).

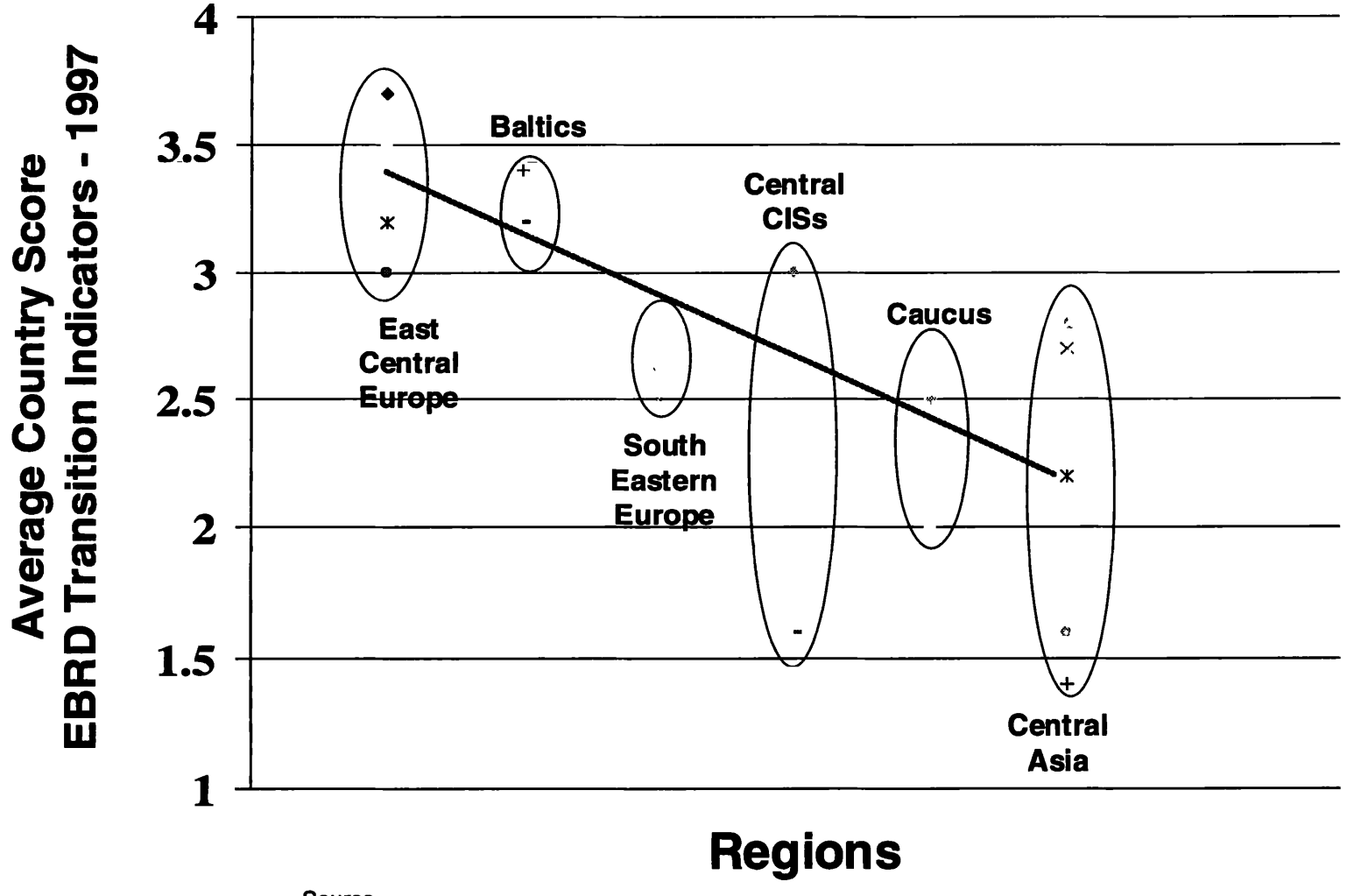
Since 1994, the European Bank for Reconstruction and Development has presented a qualitative appraisal of progress made in the movement from centrally-planned to market- based economies of CEE and FSU countries (EBRD, 1997). Transition indicators have been developed for several reform dimensions measuring progress in privatization, governance and restructuring, price liberalization, trade and foreign exchange, competition policy, banking reform, and securities markets and financial institutions. The classification system rates the various transition indicators from 1 to 4, the higher the value reflecting more progress and reform toward a fully transitioned state.

Summary indices have also been developed from the aggregate scores from across the aforementioned transition indicators on both a national, regional, and dimensional basis to describe general trends toward successful transition. These aggregate values allow for some general trend analysis but must be viewed with circumspection since they admittedly crude statistics. The annual EBRD transition indicator that is calculated as the average across all of the countries and all of the reform dimensions has shown steady progress over the four-year period the index has been calculated, increasing from 2.45 in 1994 to over 2.7 in 1997 (EBRD, 1997). There has been a notable increase across most of the reform dimensions.

There is apparent evidence of a "clustering" of such summary economic indices among many of the Danubian countries, as depicted in the Figure A.1. It is suggested that nations within the same sub-regions have, over time, managed to reach similar levels of economic reform.

Explanations given for the observed strong sub-regional pattern of reform are very complicated and intricately related. They include: "historical and cultural links to the market economy; initial socio-economic conditions; opportunities for integration with international and regional institutions; regional demonstration effects; the structure of politics and political institutions; and differences among countries in the way the previous communist system collapsed" (EBRD, 1997).

## Figure A.1 - Regional Patterns of Reform

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The observed clustering of nations into East Central Europe and South-Eastern Europe is supportive of the earlier discussion of cultural gradient and sub-regions. Further, the graphical depiction of regional pattern of economic reform illustrates how aggregate indices might be used to assist policy makers by simplifying the massive amount of quantitative socio-economic data available into a form that is easier to interpret.

The World Resources Institute and World Bank have also been pressing for incorporating the real cost of environmental pollution and natural resource depletion in what has been commonly termed "green accounting" (Hammond et. al. 1995). As a result of workshops in the early 1990s, the UNEP, and the World Bank, developed a work-in-progress handbook that provides a conceptual basis for a System of Environmental and Economic Accounting (SEEA), which describes the interrelationships of the natural environment and the economy (UN, 1993). The intent was not to replace existing data systems such as the System of National Accounts (SNA), rather, its purpose was to effect a synthesis of approaches.

**Political Indicators**

Although very difficult to measure, the importance of the ongoing democratization of CEE countries is important to regional environmental cooperation. Democratization implies easier access to information and freedom to express personal and group ideas. This added freedom empowers and motivates individuals and non-governmental organizations (NGOs) to make judgments and take actions that would not have been possible a decade ago.

While many environmental NGOs have arisen to demand environmental improvements, citizens of transition countries are understandably more interested in economic recovery and reversing negative economic trends as measured by unemployment, job insecurity, falling wages, and high inflation. The resulting fallout is that the environment is taking a back seat on many current political and socio-economic agendas (REC, 1994).

The degree to which governments allow for economic restructuring and privatization are important measures of democratization. Thus, several EBRD transition indicators may also be used and or modified as political indicators. Additionally, the degree to which governments support National Environmental Action Programmes (NEAP) and international treaties, implement environmental legislation, enforce national laws, and establish environmental financial mechanisms (e.g., fees, fines, funds) are possible areas for the development of useful aggregated political indicators.

**Environmental Indicators**

Environmental indicators and indices remain a relatively new and often controversial area. This is further complicated by fact that comparable environmental indicators have not generally been available for most countries, and each nation can be expected to have different priorities and means to collect, analyze, and report information. Pioneering work is underway by OECD, Eurostat, the World Resources Institute (WRI), the UN Environmental Program (UNEP), and the World Bank. Highly aggregated and consistently applied environmental indices are recommended which are quantifiable, easily communicate what is often a complex phenomenon, and are pertinent to policy makers.

The development of environmental indicators has been suggested as a means of pressuring many democratic governments to take action on perceived national problems. Use of such indicators is particularly evident in the Netherlands, where highly visible issues such as climate change, depletion of the ozone layer, and

acid rain have prompted the development of several aggregated indicators to monitor the success of self imposed targets and public policies.

A controversial example was the publication of a greenhouse gas index for all major countries by the WRI in 1990. However, with the passage of time and a growing concern with the greenhouse effect, the controversy has subsided. This remains an example of how the power of an indicator to communicate a complex issue can influence both public and government opinion (Hammond et. al. 1995).

In a WRI report dealing with environmental indicators in the context of sustainable development (Hammond et. al, 1995), three major categories of environmental indices are proposed, which formulate a pressure-state-response (PSR) framework. State indicators would measure the quality of the environment, pressure indicators would show the causes as to why this is happening, and response indicators would reflect actions taken.

Hammond et. al (1995) recommend four broad types of indeces, aggregated from more than 20 primary environmental indicators, be used to track environmental pressure on the environment: a pollution-emission index, a resource depletion index, an ecosystem risk index, and an index of environmental impact on human health. A similar approach is suggested for constructing state and response environmental indicators. The researchers also suggest these simple and more highly aggregated measures over conventional and often more numerous environmental data or complex data arrays or matrices.

The OECD has established a work program that has developed a series of some fifty environmental and socio-economic indicators, each according to a specific purpose and framework. The program has three major goals: tracking the environmental progress of its 29 member countries, ensuring that environmental concerns are considered during policy development for different sector enterprises, and integrating environmental concerns into policies through environmental accounting (OECD, 1998c). The various OECD countries have agreed to use the PSR model as a common framework.

The European Environmental Agency issued earlier guidelines (EEA, 1996) for compiling data used in preparing the follow assessment (EEA, 1998) to the Dobris report. In parallel, Eurostat has produced a new Statistical Compendium to accompany the Second Assessment. The major indicators reflect the twelve key environmental problems identified by Dobris and several sub-indicators. Additional socio-economic indicators measuring several societal sectors and economic development are also being tracked. The data is also being presented by various European country groups to include the EU, PHARE, and OECD countries.

# APPENDIX B

## ENVIRONMENTAL DECISION SUPPORT SYSTEMS

The evolution of automated systems supporting environmental planners, scientists, and policymakers has expanded exponentially over the last 15 years, with more economically affordable and powerful packages now available for use on personal computers. These systems must communicate the complex and dynamic nature of the environment and its management; the fact that it is often poorly and differently understood, and that it is inherently spatial (Benwell et. al, 1995).

The necessary components of a basic Decision Support System (DSS) include a data base, a model base, and a software system connecting the user (Sprague and Carlson, 1982). The DSS continues to provide a number of benefits, serving a key role in predicting the outcomes from different alternatives, encouraging increased stakeholder involvement in the modeling process itself, and generating new information and knowledge (Mann, 1996).

A DSS may comprise two related types of software: decision-analysis tools that assist in clarifying priorities (e.g., Ergo 4.0 and Expert Choice Pro 9.5), and simulation packages that incorporate risk and uncertainty into the model (e.g., Definitive Scenario 2.0 and ithink Analyst 5.0) (Gliedman, 1998). Simulation is a numerical solution procedure that, through a trial-and-error process, seeks optimal alternatives to problems that may be difficult or impossible to solve using purely mathematical algorithms. Its use of random sampling procedures to generate events and quantities are representative of a roulette wheel, labeling the technique "Monte Carlo Simulation" (Lapin, 1981).

Geographic Information Systems (GIS) have also become invaluable tools in managing and displaying the spatial nature of environmental information. Unlike the process driven DSS, the GIS is data driven with space as the independent variable (Mann, 1996). It has been suggested that neither a DSS nor a GIS have been able to meet the requisite criteria required for a computer based support system for regional environmental decision making (Benwell et. al. 1995). The coupling of simulation models (e.g., ithink/Stella) with a GIS (e.g., Arcinfo) have been recommended in earlier ecosystem models (Science Applications International Corporation (SAIC), 1993).

An integrated GIS/DSS hybrid has been proposed to overcome the limitations of each system, incorporating the best of both into a Spatial Process Modeling System (SPMS). For such a system to be effective, it would have to be relatively easy to use, interactive, provide dynamic modeling capabilities, allow for spatial analysis using vector format, provide a raster display capable of using information obtained from remote sensing, and be portable and PC based. A preliminary SPMS was developed using Visual Basic, with spatial objects based on IDRISI raster files (Mann, 1996).

# APPENDIX C

## GROUP EXERCISES

In May 1997, the United States Army War College Center for Strategic Leadership conducted a gaming exercise addressing a hypothetical environmental problem set in Eastern Europe (Auger, 1997). This exercise was scheduled to coincide with a meeting of the NATO Committee on the Challenges of Modern Society (CCMS) Pilot Study on "Environmental Security in an International Context." This allowed for the participation of an international group of policy makers and experts on environmental issues. The Center's non-attribution approach and interactive computer systems expedited group participation in prioritizing regional environmental security problems and identifying policy options for addressing them based on their unique national and institutional perspectives. The list of the top nine environmental challenges identified by participants' consensus is shown in Table C.1.

The NATO School in Oberammergau, Germany conducts a series of courses throughout the academic year, three of them environmental. The school was receptive to the incorporation of a two-hour class exercise on environmental security in the Danube River Basin during its regularly scheduled course entitled "Responsibilities of Military Forces in Environmental Protection." This is a two-week course offered to NATO and cooperation partners, aimed at familiarizing officers, non-commissioned officers, and civilians with applicable environmental policies and practices to assist them in reducing or avoiding damage to the environment as a result of military operations. A detailed synopsis was provided the NATO School in advance of the class exercise (Table C.2).

The NATO School class exercise was conducted on 20 July 1998. A short presentation proceeded the exercise to provide the 40 international students with sufficient background information for their subsequent work group discussions. Students were preassigned to four separate work groups: a NATO group of Danubian countries; a group of CEE Danubian countries; a NATO group of non-Danubian countries; and a group comprised of other countries. Each group was requested to provide a consensus rank-ordered listing of the major environmental issues or stressors facing the Danube River Basin, appropriate policy responses, and known (or likely) cases where environmental issues or stressors have led or contributed to increased tensions or conflict between nations within the region. To help expedite the entire exercise and focus work group efforts, a one-page worksheet was developed (Table C.3). Each group selected a member to present their results to the entire class using the summary worksheet.

A summary the work group efforts is provided in Table C.4. Results from Groups 1 and 2, comprised of members from Danubian countries, appear more focused, likely reflecting a greater interest in the overall subject matter and a better understanding of the interrelated and complex underlying and interrelated social, political, and economic issues.

Results from Group 2 appear relatively consistent with the major regional environmental security issues presented earlier in the paper, and with the results provided in Table C.1. Group members were primarily from Poland, Romania, Hungary, and Slovenia and, thus, would be expected to have more direct knowledge of issues impacting the mid and lower reaches of the Danube.

The class exercise was a valuable and practical demonstration of how complex regional environmental security issues are, especially when viewed from different perspectives. Similar exercises were suggested for the future with additional time provided to allow for more detailed work group discussions and development of policy options.

## Table C.1 - GAME REPORT - SUMMARY
## Rank Ordered Environmental Challenges

The final component of the gaming exercise allowed participants to determine the combined group consensus on prioritization of the top nine ranked environmental challenges facing Eastern Europe, based on prior work group activities representing NATO, Eastern Europe, and two hypothetical Southeastern European countries (Auger, 1997). The consensus rank ordering of the top nine environmental challenges facing Eastern Europe was determined as follows:

1. Prevent nuclear accidents
2. Fresh water scarcity and degradation
3. Climate change
4. Energy scarcity
5. Increasing population pressures - migration
6. Nuclear waste disposal
7. Air pollution
8. Deforestation
9. Disposal and handling of Toxic and Hazardous Wastes

## Table C.2 - CLASS SYNOPSIS

**1. TIME/DATE:** 1530-1700, Monday, 20 July 98

**2. TITLE:** Environmental Security in the Danube River Basin - Class Exercise

**3. PRESENTER:** Mr. Steven R. Hearne

**4. TOPICS:**

**a. Presentation (30 minutes):** Intent is to provide students with necessary background information to prepare them to meet and discuss related issues in groups during the class exercise. The topics (still being refined) would comprise:

* Introduction and Explanation of the Class Exercise - 5 minutes
* Overview of the Danube River and Basin - Facts and Figures - 5 minutes
* Regional Historic and Cultural Perspective - 2 minutes
* Navigation and Transport - The Danube as an Economic Waterway - 3 minutes
* Energy in the Danubian Countries - Environmental Considerations - 5 minutes
* Water Quality Summary by Major Categories of Pollutants - 5 minutes
* Air Quality - 2 minutes
* Danube Environmental Program and Related Organizations - 3 minutes

**b. Class Exercise (60 minutes)** - Exercise must be conducted in such a way as to promote free exchange of ideas in a very limited time period and to fully ensure non-attribution. This hour is envisioned being broken into 3 distinct sections:

**(1) Individual Responses (10 minutes)** - Intent is to allow each student a few minutes to compose their thoughts on the questions asked on the one-page handout "prior" to going into a specific group. The student would be asked to turn in their filled out paper, with only their country identified (no names).

**(2) Group Exercise (30 minutes)** - Intent is to encourage development of a consensus response to questions to the same one-page handout. Ideally, the groups might be preassigned as follows, however, this will need to be coordinated with the course director based on number of students and countries represented:

* one NATO Group of Danubian Countries (Germany, Austria, Italy, Turkey).
* one NATO Group of non-Danubian Countries (U.S., France, etc.).
* one Group of Central and Eastern European Danubian Countries (e.g., Hungary, Czech Rep, Slovakia, Slovenia, Moldova, Ukraine, Romania, Bulgaria, Poland, Albania, Croatia, B-H, Former Yugoslavia)
* one Group of Other Countries (Russia, etc..)

**(3) Group Presentations/Discussion (20 minutes)** - Intent is to allow each of the groups a few minutes to present their consensus results and to encourage open discussion.

**5. HANDOUT:** An easy-to-read one-page handout (being developed) will be provided each student and then each group for use in recording key information. The types of questions will likely include:

* List the major environmental issues (stressors) you believe are facing the Danube River Basin.

* Rank order (prioritize) these major environmental issues that by itself, or in combination with some other social, cultural, political, or economic factor, are likely to present the greatest threat to the security (destabilization) of the region.

* List any past cases where environmental issues/stressors are believed to have led or contributed to increased tensions or conflict between nations within the region.

* List what policy options should be taken to address these major environmental issues and by whom (NATO, European Union, United States, etc..).

## Table C.3 - CLASS EXERCISE

1. List the major environmental issues (stressors) you believe are facing the region (Danube Basin) - use matrix below.
2. Rank order (prioritize) these major environmental issues that, by itself, or in combination with some other social, cultural, political, or economic factor are likely to present the greatest threat to security (e.g., the stability) of the region. - use matrix below.
3. List several cases where environmental issues or stressors have led or contributed to increased tensions or conflict between nations within the region (or likely cases).

*
*
*

4. List what policy options should be taken to address these major environmental issues and by whom (NATO, EU, US, Nation, UN, etc..).

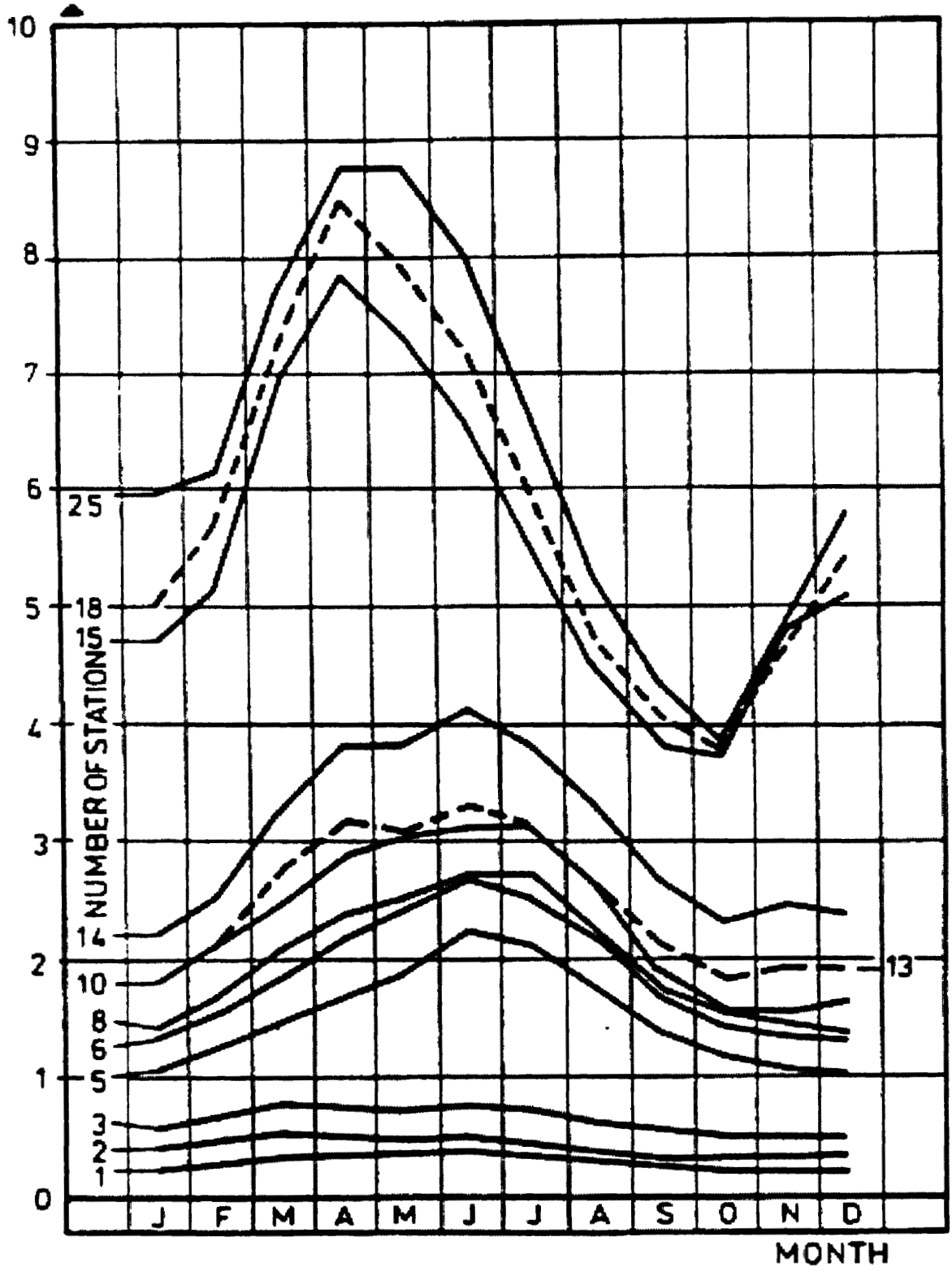
| Rank | Major Environmental Issues (Stressors) | Policy Options |
|---|---|---|
| [ ] | | |
| [ ] | | |
| [ ] | | |
| [ ] | | |
| [ ] | | |
| [ ] | | |
| [ ] | | |

## Table C.4 - NATO Class Exercise Results

**RANKING OF MAJOR ENVIRONMENTAL ISSUES AND STRESSORS IN THE DANUBE RIVER BASIN**

| GROUP 1<br>NATO DATABASE | GROUP 2<br>NON-NATO<br>(CEE ) DANUBIAN | GROUP 3<br>NATO NON-DANUBIAN | GROUP 4<br>OTHER COUNTRIES |
|---|---|---|---|
| Agricultural pollution | Radioactive waste | Chemicals - agriculture | Pollution - drinking water, nuclear agriculture human, ecosystem |
| Regional uses and goals for future river use | Potable water | Chemicals - industry | Control of water |
| Water supply quality in lower Danube | Agricultural runoff | Solid/liquid wastes | Legislation |
| GNP/population - national health | Polluted fish | Chemicals - domestic | GNP - economics |
| Regional development over past 100 years | Radioactive cooling waste | Energy | |
| Wastewater treatment | Erosion | Dams | |
| Main-Danube Canal - transport introduction of new species | Danube Delta Damage/ Black Sea | Erosion | |
| Regional responsibilities - agricultural and industrial cleanup | | | |

## APPENDIX D
## Seasonal Pattern of Mean Monthly Discharges

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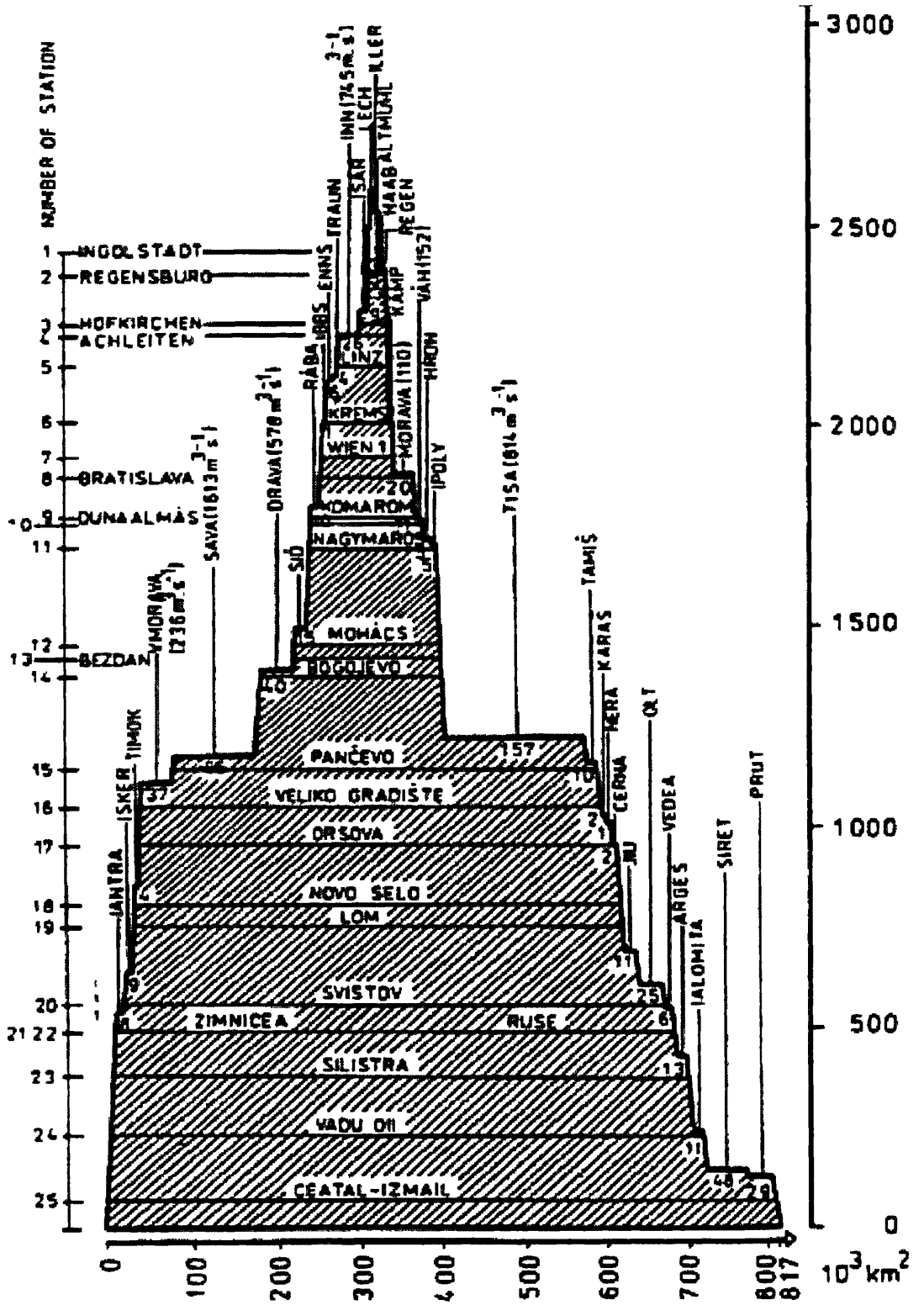
Strategic Action Plan for the Danube River Basin - 1995-2005, EPDRB Task Force, reproduced by permission of the Canube Programme Coordination Unit

# APPENDIX E
## Contribution of Flow From the Danube River Tributaries

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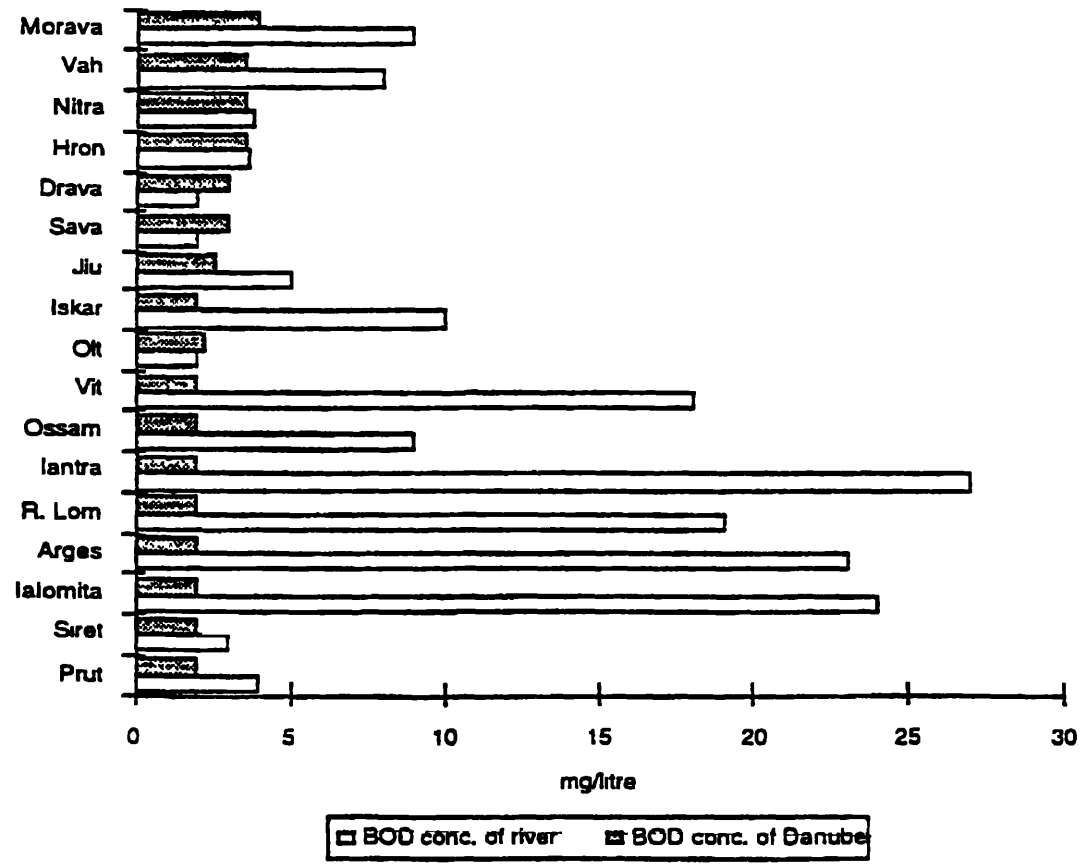
# APPENDIX F
## The BOD Situation in the Danube River

**Box 4.2 The BOD situation in the Danube River and some of its tributaries**

The discharge of organic matter creates major problems in many of the Danube tributaries. Organic matter exhibiting BOD is a source of food for microorganisms, thereby causing microbial heterotrophic growth and oxygen uptake. This oxygen uptake lowers the dissolved oxygen concentration under constant conditions – even more so if reaeration is low. Both factors below a certain level will have negative impacts on fish reproduction and general biodiversity. This can make the water unfit for uses like water supply and recreation. These problems have resulted in the construction of biological waste water treatment plants in many of the cities along the tributaries.

On the main Danube River, the organic material load does not create major problems. The dilution and self-purification capacity of the Danube is high and the river is able to handle the organic material from untreated sewage from the major cities along the river and the high BOD load from some of the tributary rivers, without serious decrease of the oxygen concentration in the river water. The data provided from the monitoring under the Bucharest Convention shows in fact an improvement on BOD level in the lower reaches compared to the upper part of the river.

**BOD concentration in some of the tributaries and the Danube in the confluence with the tributaries**

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## APPENDIX G
## National Action Plans: Status of Preparation, January 1997

| Country | NAP Progress |
|---|---|
| Austria | * A draft NAP has been prepared and consultations begun.<br>* By mid-summer of 1997 the approval process will hopefully be completed. |
| Bulgaria | * The final draft NAP is ready. Final approval has been delayed. |
| Croatia | * The NAP will be part of the National Environmental Strategy (NES) for which a drafting group has been established and is now at work. |
| Czech Republic | * The NAP is ready as final draft (6th version). It has main goals and strategic directions which follow the SAP.<br>* The NAP will be approved by the Czeck government during the first half of 1997. |
| Germany | * The NAP is ready and approved, copies are mailed to relevant parties. |
| Hungary | * The NAP is part of the six-year National Environment Programme (NEP) required by the 1995 Environmental Protection Act.<br>* The NEP has been adopted by the government and transmitted to the Parliament for final approval. The Parliament starts discussion on it in Apirl 1997. |
| Moldova | * The draft NAP has been presented to the president. |
| Romania | * The NAP is part of the National Environmental Action Plan (NEAP) approved by the Parliament in 1995. English summary has been prepared.<br>* The NEAP includes a chapter with concrete projects to solve the short term priorities hot spots (102 projects for air and water).<br>* National budgetary resources have been allocated for environmental reconstruction. |
| Slovak Republic | * A NAP steering committee and drafting group have been established, including inputs from NGOs. The first draft of NAP has been completed by October 1996, and has to be further harmonized with other state departments. |
| Slovenia | * The State Environmental Report has been completed.<br>* The NEP has been prepared but not adopted yet. It will cover the main fields of environmental protection (including water). |
| Ukraine | * The first draft has been prepared and considered.<br>* By mid-1997, the draft will be finalized. |

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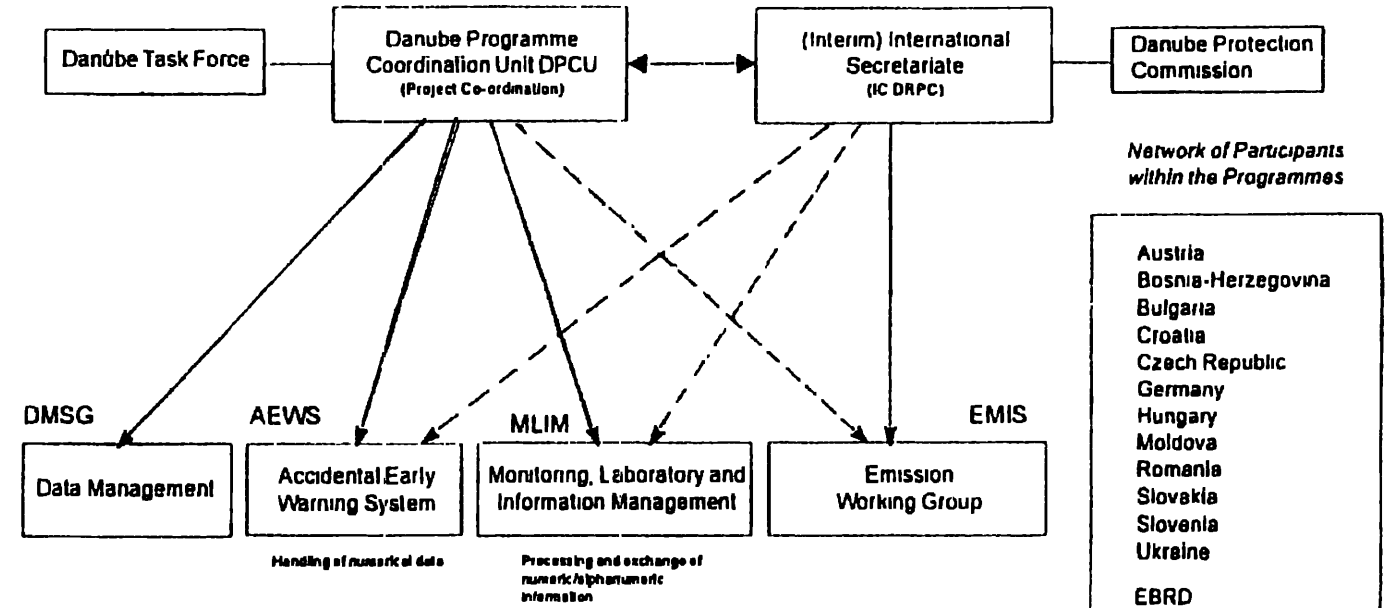
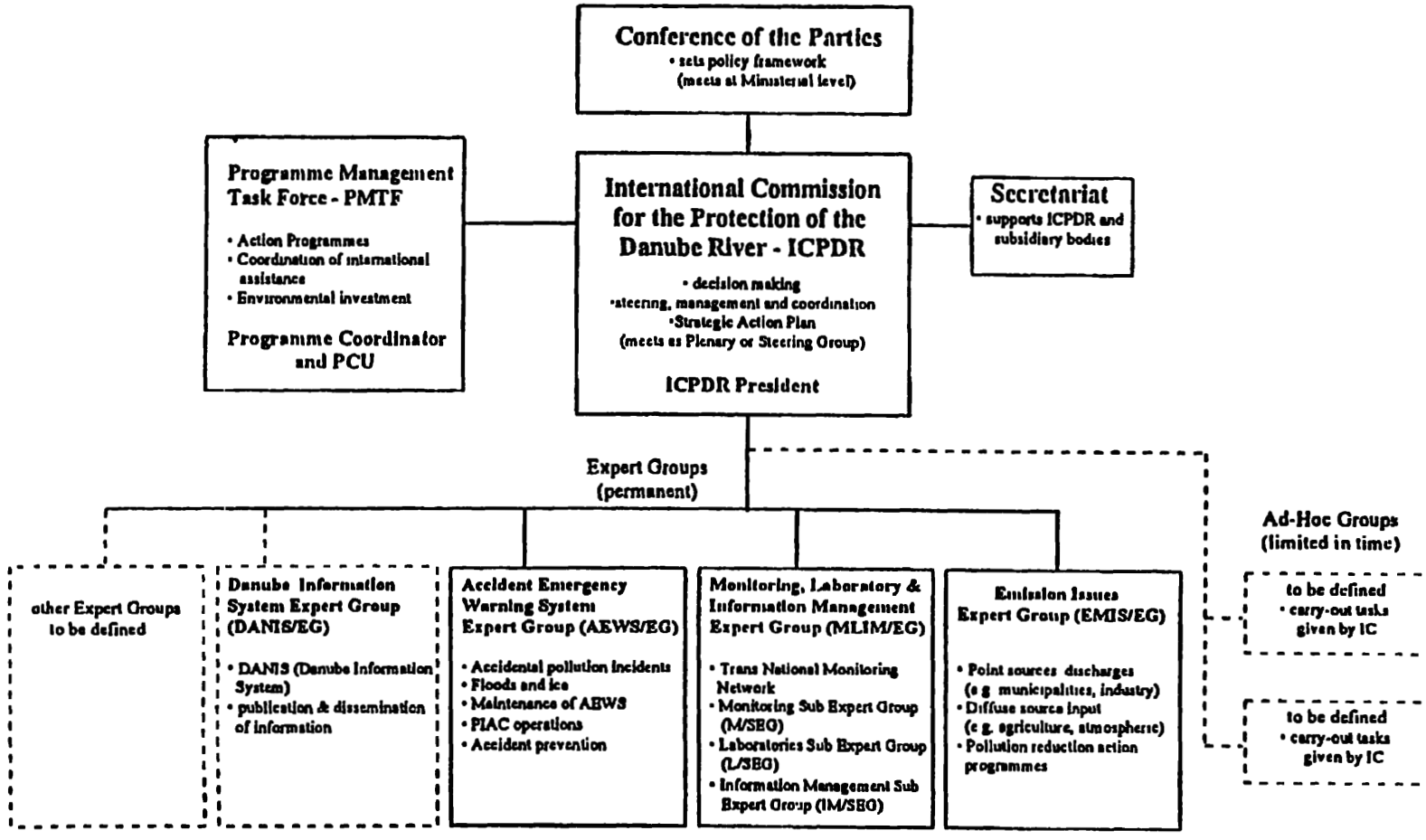
Annual Report 1996, Environmental Programme for the Danube River Basin (EPDRB), reproduced with permission of the Danube Programme Coordination Unit

# APPENDIX H
## Interim Danube Program Organization




Source
Framework for the Development of an Information Network, 1998 Report for the International Commission for the Protection of the Danube River, reproduced with permission of the Danube Programme Coordination Unit

# APPENDIX I
## Permanent ICPDR Organization

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The Danube Pollution Reduction Program, Discussion Paper for the International Conference on Water and Sustainable Development, 1998, Environmental Programme For the Danube River Basin (EPDRB), reproduced with permission of the Danube Programme Coordination Unit